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MassDEP RTN 3-23246

Class A-3 Response Action Outcome Partial Statement for 12 Morton Street, Somerville, Massachusetts

50 Tufts Street Site, Somerville, Massachusetts

Submitted to:
UniFirst Corporation
68 Jonspin Road
Wilmington, MA 01887

REF
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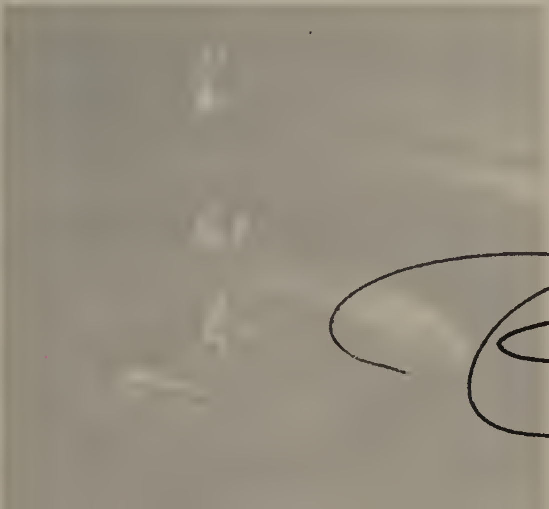

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Executive Summary

On behalf of UniFirst Corporation (UniFirst) of Wilmington, Massachusetts, GEI Consultants, Inc. (GEI) prepared this Class A-3 Response Action Outcome Partial (RAO-P) Statement for 12 Morton Street, Somerville, Massachusetts (the Property), which is a portion of the 50 Tufts Street site (the Site; Fig. 1). The Site is identified by Massachusetts Department of Environmental Protection (MassDEP) Release Tracking Number (RTN) 3-23246. A Site Map that shows the Property in relation to the Site boundary is presented in Fig. 2. This document provides closure for a portion of the Site under the Massachusetts Contingency Plan (MCP; 310 CMR 40.0000) and indicates that a condition of No Significant Risk (NSR) exists at the Property.

A release of chlorinated volatile organic compounds (VOCs) to soil and groundwater at the Site was first reported to the MassDEP in 2002. Subsequent investigations at the Site identified chlorinated VOCs, particularly tetrachloroethylene (also called perchloroethylene [PCE]), in indoor air at 50 Tufts Street, and in groundwater and indoor air at residential and commercial properties in the vicinity of 50 Tufts Street, including the Property.

To mitigate the vapor intrusion pathway at the Property, GEI installed an Exposure Pathway Elimination Measure (EPEM). In the basement, the EPEM consists of a new concrete floor with vapor sumps installed beneath the concrete and a vapor barrier system covering both the floor and the fieldstone foundation walls, together with a venting system beneath the vapor barrier.

Four rounds of indoor air testing conducted after the installation of the EPEM did not detect chlorinated VOCs above laboratory method reporting limits. Based on the post-EPEM indoor air sampling results, the EPEM has mitigated the vapor intrusion pathway and achieved a condition of NSR at the Property. An Activity and Use Limitation (AUL) has been recorded at the Middlesex South District Registry of Deeds requiring the maintenance of the EPEM at the Property to maintain a condition of NSR.

A Class A-3 RAO-P Statement is appropriate for the Property based on the following:

- Remedial actions were conducted and a Permanent Solution has been achieved.
- A condition of NSR to human health, safety, public welfare, and the environment exists for all receptors.
- An AUL is required to maintain a condition of NSR.
- Oil or hazardous material at the Property do not exceed the applicable Upper Concentration Limit in soil or groundwater.

1. Introduction

On behalf of UniFirst Corporation (UniFirst) of Wilmington, Massachusetts, GEI Consultants, Inc. (GEI) prepared this Class A-3 Response Action Outcome Partial (RAO-P) Statement for 12 Morton Street, Somerville, Massachusetts (the Property), which is a portion of the 50 Tufts Street site (the Site; Fig. 1). The Site includes 50 Tufts Street, surrounding residential and commercial properties to the east and immediately west of 50 Tufts Street, and the Michael E. Capuano Early Childhood Center (Capuano Center). A Site Map that shows the Property in relation to the Site boundary is presented in Fig. 2. Chlorinated volatile organic compounds (VOCs), particularly tetrachloroethylene (also called perchloroethylene [PCE]), have been detected in soil, groundwater (shallow and deep overburden, and bedrock), soil vapor, and indoor air at portions of the Site.

This document provides closure for a portion of the Site under the Massachusetts Contingency Plan (MCP; 310 CMR 40.0000), and indicates that a condition of No Significant Risk (NSR) exists at the Property.

The Site is identified by Massachusetts Department of Environmental Protection (MassDEP) Release Tracking Number (RTN) 3-23246. The "Immediate Response Action Plan" associated with RTN 3-23246 was submitted to MassDEP on January 9, 2006. The Site is currently classified Tier IC (Permit No. W085813). The "Phase II Comprehensive Site Assessment, Method 3 Risk Characterization, and Phase III Remedial Action Plan," (Phase II/III) for the Site was submitted to MassDEP on July 14, 2008. The "Phase IV Remedy Implementation Plan," (Phase IV) was submitted to MassDEP on August 10, 2009. The "Immediate Response Action Completion Report and Remedial Monitoring Report No. 11," (IRAC Report) was submitted to MassDEP on November 13, 2009, and the "Immediate Response Action Completion Report Addendum," was submitted to MassDEP on April 1, 2011. The "Phase IV Final Inspection Report, Remedial Monitoring Report No. 15, and Phase V Remedy Operation Status Report," was submitted to MassDEP on August 4, 2011.

1.1 Purpose

The purpose of this Class A-3 RAO-P Statement, in accordance with the requirements of the MCP, is to document that a Permanent Solution for the Property portion of the Site has been achieved.

1.2 Scope

The scope of this Class A-3 RAO-P Statement for the Property is to:

- Provide a summary of the environmental conditions.
- Provide a summary of the mitigation conducted at the Property.
- Evaluate the risk to human health, safety, public welfare, and the environment at the Property.
- Demonstrate that the applicable requirements for a Class A-3 RAO-P Statement have been achieved.

1.3 Submittals

The original MassDEP transmittal form (BWSC-104) was submitted online via eDEP and a copy is included in Appendix A. As required by the MCP (310 CMR 40.1403[3][f]), GEI submitted letters to the Somerville Chief Municipal Officer and the Board of Health notifying them of the availability of this Class A-3 RAO-P Statement. Copies of the notification letters are in Appendix B.

The Method 3 Risk Characterization demonstrating that a condition of NSR has been achieved at the Property is included in Appendix C.

An Activity and Use Limitation (AUL) was prepared to maintain a condition of NSR at the Property. A copy of the AUL, along with copies of the required public and legal notifications for the AUL, was previously submitted to MassDEP on November 19, 2009. A copy of the AUL is in Appendix D.

1.4 Public Record

Documents related to the environmental investigations conducted at the Site are on file with the MassDEP Northeast Regional Office located at 205B Lowell Street in Wilmington, Massachusetts. Additionally, local public document repositories have been established at the Somerville Central Public Library and at the City of Somerville Clerk's Office. GEI also provides electronic versions of the repository documents to the City for posting to its web site.

1.5 Contact Information

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1.6 Conceptual Site Model

GEI developed this Conceptual Site Model (CSM) to describe release mechanisms, contaminant distribution, and potential exposure pathways associated with the Property. The CSM is based upon the investigation data documented in the Phase II/III and IRAC Reports. Site features associated with the CSM are shown in Fig. 2.

1.6.1 Property Location and Description

The Property is located within the Site boundary associated with a release of chlorinated VOCs to soil and groundwater at 50 Tufts Street, located approximately 150 feet (ft) east of the Property. The Property is located in a commercial/residential zoning district, fronts Morton Street to the east, and is bounded by residential property to the north, south, and west. The Property is occupied by a multi-family residential building. The building is constructed with a basement.

1.6.2 Contaminant Distribution

From approximately 1955 to approximately 2002, 50 Tufts Street was used for storage and distribution of industrial chemicals, laundry supplies, and dry cleaning supplies. Chemicals stored at and delivered to and from 50 Tufts Street included chlorinated solvents. These chlorinated VOCs – particularly PCE, trichloroethylene (TCE), and 1,1,1-trichloroethane (TCA) – have been detected in soil, soil vapor, indoor air, and groundwater at 50 Tufts Street. A release of chlorinated VOCs to soil and groundwater at the Site was first reported to MassDEP in 2002.

Chlorinated VOCs generally have not been detected in soils beyond the boundaries of 50 Tufts Street, and they were not detected in the soil sample collected from beneath the building at the Property. Chlorinated VOCs have been detected in the soil vapor at the Property.

Chlorinated VOCs have been detected in groundwater in areas near 50 Tufts Street. The eastern boundary of the Site is based on the lateral extent of the deep overburden and bedrock groundwater plumes, where very low concentrations of PCE have been detected in groundwater collected from wells in till and bedrock (Fig. 2).

Chlorinated VOCs have also been detected in soil vapor beneath and in areas near 50 Tufts Street, primarily in areas overlying the shallow overburden groundwater plume (Fig. 2). Migration of VOCs from soil vapor into overlying buildings is known as "vapor intrusion." Sub-slab soil vapor testing and/or indoor air testing identified complete vapor intrusion pathways at 50 Tufts Street, at some residences and commercial buildings within the Site, and at the Capuano Center. A complete vapor intrusion pathway also was identified at the Property.

Based on the impacted media, potential receptors that could be exposed to contaminants at the Property include residents and construction workers during subsurface work.

A detailed description of the investigations conducted to characterize the Site geology and hydrogeology, the nature and extent of contamination at the Site, and the results of those investigations, was presented in the Phase II/III.

2. Property Investigations

Since March 2006, GEI has conducted subsurface investigations that included collecting soil, groundwater, soil vapor, and indoor air samples across the Site for laboratory testing. The investigations associated with the Property are summarized below. The laboratory reports associated with the samples that are characteristic of conditions at the Property have been submitted to MassDEP under previous submittals, and are not re-presented in this report.

2.1 Groundwater Sampling

There is no groundwater monitoring well located at the Property. However, the concentrations of chlorinated VOCs detected in groundwater samples collected from monitoring well MW103, located approximately 100 ft southeast of the Property, are considered to be representative of groundwater conditions at the Property. MW103 is a shallow well screened between 6 and 16 feet below ground surface.

Six groundwater samples have been collected from MW103 between May 2006 and April 2007. The groundwater samples were submitted to Accutest Laboratories (Accutest) of Marlborough, Massachusetts for analysis of VOCs by U.S. Environmental Protection Agency (EPA) Method 8260. The laboratory testing results for groundwater samples collected from MW103 are summarized in Table 1.

2.2 Soil Vapor Sampling

In May 2007, GEI collected a sub-slab soil vapor sample from beneath the building at the Property. GEI submitted the sample to Accutest for VOC analysis by EPA Method TO-15 for the following site-specific list of analytes:

- Carbon tetrachloride
- Chloroethane
- 1,1-Dichloroethane
- 1,2-Dichloroethane
- 1,1-Dichloroethylene
- cis-1,2-Dichloroethylene
- trans-1,2-Dichloroethylene
- 1,1,2,2-Tetrachloroethane
- Tetrachloroethylene (PCE)
- 1,1,1-Trichloroethane (TCA)
- 1,1,2-Trichloroethane
- Trichloroethylene (TCE)
- Vinyl Chloride

PCE was detected above laboratory reporting limits in this sample. The laboratory testing results for this soil vapor sample are summarized in Table 2.

Based on this soil vapor result, GEI installed an air purifier to mitigate the potential vapor intrusion pathway.

2.3 Indoor Air Sampling

An Exposure Pathway Elimination Measure (EPEM) was installed in the basement at the Property between January and March 2008 based on the results of soil vapor testing. The EPEM consists of a new concrete floor with vapor sumps installed beneath the concrete and a vapor barrier system covering both the floor and the fieldstone foundation walls, together with a venting system beneath the vapor barrier.

GEI collected post-EPEM installation indoor air samples from the basement and first floor twice in March 2008 (duplicate samples), and then in April 2009, and March and November 2010. The November 2010 indoor air samples were also used to evaluate the EPEM performance following repairs that were made to storm water entry points and cracks in the vapor barrier caused by basement flooding during successive spring 2010 storm events. The basement flooding resulted from natural causes entirely independent of any measures instituted as part of the EPEM.

In March 2008 and April 2009, GEI collected indoor air samples from the basement and first floor of the residence over an approximately 4-hour period using SUMMA® canisters. The March and November 2010 indoor air samples were collected over an approximately 24-hour period to reflect MassDEP's current preference for 24-hour sampling of residences. All indoor air samples were submitted to Accutest for laboratory analysis by EPA Method TO-15 and reporting of the site-specific list of compounds.

VOCs were not detected above laboratory reporting limits during these sampling events, but PCE was detected at the reporting limit in the basement in the March 2010 event. Indoor air testing therefore indicates that the EPEM is effective. The laboratory testing results for indoor air samples are summarized in Table 3.

2.4 Soil Sampling

During installation of the EPEM in January 2008, a soil sample was collected from beneath the building foundation. The sample was submitted to Accutest for laboratory analysis of VOCs by EPA Method 8260. Chlorinated VOCs were not detected above laboratory reporting limits in this sample. Approximately 12 tons (10 cubic yards) of non-hazardous soil were excavated during the EPEM installation and shipped to American Reclamation Corporation in Charlton, Massachusetts for disposal. Disposal documentation for this

material was submitted with "Immediate Response Action Status Report No. 5 and Remedial Monitoring Report No. 8," dated May 12, 2008.

The laboratory testing results for the soil sample collected from the Property are summarized in Table 4.

3. EPEM Installation

GEI installed an EPEM in the basement at the Property consisting of a new concrete floor with vapor sumps installed beneath the concrete and a vapor barrier system covering both the floor and the fieldstone foundation walls, together with a venting system beneath the vapor barrier. The EPEM installation was completed in March 2008. Sketches of the EPEM installed in the basement are shown in Fig. 3 and Fig. 4.

Perforated polyvinyl chloride (PVC) pipe was installed in the five vapor sumps, placed near each corner and one in the middle of the basement. The vapor sumps were backfilled with crushed stone. A vapor transmission layer below a vapor barrier was installed on the basement floor, and a new 4-inch concrete slab was poured. The vapor sump piping was connected to above-slab ventilation piping that extends up to the floor joists, exits the building above the sill, and extends above the roofline. The EPEM also includes a wall vapor barrier system comprised of a vapor transmission plane, flexible membrane, and an approximately 1-inch-thick layer of cementitious stucco that covers the field stone foundation. The modified basement walls and floor are coated with a two-part epoxy vapor barrier. Soil vapor is captured by the vapor transmission layer and vapor sump piping and ventilated to the outdoor ambient air, bypassing the pathway through the slab into indoor air. The ventilation system is designed so that an electric-powered fan may be added, if necessary, to facilitate the flow of soil vapor through the ventilation system. A downdraft prevention cap was installed at the end of the ventilation pipe from the basement above the roofline.

A schedule for post-EPEM confirmatory indoor air sampling was presented in the Phase IV. To evaluate the performance of the EPEM, indoor air samples were collected shortly after installation was completed. GEI collected post-EPEM indoor air samples from the basement and first floor on March 5 and 21, 2008, in April 2009, and in March and November 2010. Chlorinated VOCs were not detected above laboratory reporting limits during these sampling events, but PCE was detected at the reporting limit in the basement in the March 2010 event. Indoor air testing therefore indicates that the EPEM is effective. The laboratory testing results for indoor air samples are summarized in Table 3.

4. Method 3 Risk Characterization

ARCADIS U.S., Inc. (ARCADIS), of Chelmsford, Massachusetts prepared a Method 3 Risk Characterization Report for the Property (12 Morton Street Risk Characterization) in accordance with 310 CMR 40.0900 based on the characterization of current and foreseeable Site uses, potential receptors, potential exposure pathways, compounds of potential concern (COPCs), and calculated exposure point concentrations (EPCs). The 12 Morton Street Risk Characterization evaluates risk associated with the portion of the Site at 12 Morton Street in Somerville, Massachusetts. The complete ARCADIS Risk Characterization Report, including the risk characterization methodologies and parameters, is in Appendix C.

Four Site-wide Method 3 Risk Characterization Reports were previously prepared for the Site. The July 2008 Phase II/Phase III included a Method 3 Risk Characterization for the Site, prepared by AMEC Earth & Environmental (AMEC) of Westford, Massachusetts. In response to MassDEP comments, AMEC prepared a Supplemental Method 3 Risk Characterization (Supplemental Risk Characterization) in May 2009. The Supplemental Risk Characterization evaluated potential risks using the framework in the July 2008 Method 3 Risk Characterization, including an indoor air Exposure Assessment for each affected residence without an effective vapor mitigation system. A Revised Supplemental Risk Characterization was prepared to support the IRAC Report. Potential risks presented in the Supplemental Risk Characterization were updated in the Revised Supplemental Risk Characterization to reflect additional data collection and additional EPEMs installed by GEI. An Updated Revised Supplemental Risk Characterization was prepared by ARCADIS in April 2011 to respond to a MassDEP Notice of Audit Findings and Notice of Noncompliance for the IRAC Report.

The 12 Morton Street Risk Characterization indicates that the Property poses a condition of NSR to human health, safety, public welfare, and the environment.

4.1 Current and Reasonably Foreseeable Site Activity and Use

Consistent with the requirements of the MCP (310 CMR 40.0923), the 12 Morton Street Risk Characterization considered both current and future uses of the Property. The current use of the Property is as a residence, and the reasonably conservative foreseeable use of the Property is also residential.

4.2 Potential Human Receptors

Potential human receptors were identified based on current and foreseeable uses of the Property. Current use receptors at the Property are residents. Future use receptors of the Property are future residents and construction workers during potential future excavation/development activities.

4.3 Potential Environmental Receptors

The Property is in an urban area, is fully developed, and would not likely represent a potentially significant terrestrial habitat. Based on the scarcity of open land, the Property does not provide for exposures for potential terrestrial receptors.

The closest surface water bodies are the Mystic River, located approximately 1 mile northeast of the Property and the Charles River located approximately 1.7 miles south-southeast of the Property. Based on the distance to the nearest aquatic receptors and the current levels of COPCs in groundwater, the transport of COPCs in groundwater to surface water and sediment is not considered to be a significant exposure pathway.

4.4 Summary of Analytical Results

The environmental conditions at the Property have been characterized based on data collected from the Property, and data collected in the immediate vicinity of the Property, as described in Section 2. The 12 Morton Street Method 3 Risk Characterization uses a broader set of Site data in order to present a conservative evaluation of risk. The 12 Morton Street Risk Characterization considered soil, groundwater, soil vapor, and outdoor air data presented in the Phase II/Phase III (more recent groundwater and soil data exhibited COPC concentrations that were consistent with or less than the concentrations associated with data presented in the Phase II/Phase III). Consistent with prior Risk Characterizations, the results from soil, groundwater, soil vapor, and outdoor air samples collected within the "Other Streets" exposure area were used to estimate potential risks for receptors at the Property. These data were presented in Tables 11-1e, 11-2e, 11-3e, and 11-4 of the Phase II/Phase III. Only a subset of the full "Other Streets" soil, groundwater, and soil vapor datasets are re-presented in Tables RC-1, RC-2, and RC-3 of the 12 Morton Street Risk Characterization. These tables present only those sample locations from which one or more EPCs were selected (maximum detects or maximum temporal averages of one or more COPCs).

An EPEM is installed at the Property and an AUL is in place to maintain the EPEM. Post-EPEM indoor air samples were collected from the basement and first floor at the Property on March 5 and 21, 2008, in April 2009, and in March and November 2010. PCE was not

detected above laboratory reporting limits during these sampling events, but was detected at the reporting limit in the basement in March 2010. Indoor air testing indicates that the EPEM has mitigated the vapor intrusion pathway. Risks associated with the residual indoor air concentrations detected in the basement were evaluated in the 12 Morton Street Risk Characterization.

4.5 "Hot Spot" Evaluation

Under the MCP (310 CMR 40.0924), "hot spots" must be considered as distinct exposure points. A "hot spot" is defined as a discrete area where the concentrations of oil or hazardous material (OHM) are substantially higher than those concentrations in the surrounding area. No "hot spots" have been identified at the Property.

4.6 COPCs

The COPCs at the Site have been limited to certain chlorinated solvents, together with their associated breakdown products. Using a standard screening process, the following compounds were defined as COPCs for all soil, groundwater, indoor air, excavation/trench air, and outdoor air exposures: 1,1-dichloroethane, 1,1-dichloroethylene, cis-1,2-dichloroethylene, trans-1,2-dichloroethylene, PCE, TCA, TCE, and vinyl chloride. Chloroform, chloroethane, and carbon tetrachloride were also defined as COPCs for soil, groundwater, and excavation/trench air exposures only.

The following compounds were detected in at least one groundwater sample collected from shallow groundwater monitoring well MW103: chloroform, 1,1-dichloroethane, 1,1-dichloroethylene, cis-1,2-dichloroethylene, 1,4-dioxane, methyl tert-butyl ether (MTBE), 1,1,1,2-tetrachloroethane, PCE, TCA, and TCE.

The compounds 1,4-dioxane, MTBE, 1,1,1,2-tetrachloroethane have not historically been detected in groundwater above the laboratory reporting limits at the 50 Tufts Street property, and as such, these compounds are not considered to be associated with the releases of OHM at 50 Tufts Street. Therefore, these compounds are not COPCs at the Site and are not evaluated further in this risk characterization for the Property.

4.7 Exposure Pathways

An exposure assessment under the MCP is the process of identifying the potential for on-Site and surrounding area receptors, both human and environmental, to contact chemicals in the soil and groundwater. Exposure pathways are the mechanisms by which receptors may be exposed to COPCs at the Site.

Where applicable, exposure pathways included incidental ingestion and dermal contact with soil, inhalation of soil-derived fugitive dust, inhalation of airborne constituents in indoor and outdoor air, and inhalation of airborne constituents in excavation air.

The 12 Morton Street Risk Characterization assumes dewatering will occur prior to future construction activities and that direct contact with groundwater would be minimal. Therefore, incidental ingestion and dermal contact with groundwater were not quantitatively evaluated.

4.8 Identification of EPCs

The MCP requires that EPCs be representative of actual and foreseeable exposures. The development of EPCs often involves statistical analysis of the data. For example, in the MCP, the MassDEP recommends the use of average concentrations.

Exposure points are defined as locations of potential contact between a receptor and portions/media of a property. The EPC is defined as the chemical concentration in a given medium which a potential receptor may encounter at an exposure point. EPCs were developed for each exposure medium at the Property. The EPCs used to evaluate potential exposures at the Property are consistent with the EPCs selected for the “Other Streets” exposure area presented in the prior Site-wide Risk Characterizations.

The 12 Morton Street Risk Characterization performed a Worst Case assessment for exposures at the Property. To calculate the soil, soil vapor, and groundwater EPCs, the maximum soil concentration and maximum temporal average of each groundwater and soil vapor monitoring point were used for each COPC. The temporal average of the measured concentrations was calculated assuming that non-detected compounds were present at one-half the laboratory reporting limit. If a COPC was not detected, then one-half the lowest laboratory reporting limit was used as the EPC for that COPC.

The arithmetic mean of measured concentrations in outdoor air was used to represent the outdoor air EPC for each COPC.

The indoor air EPC for each COPC was calculated in the following manner. First, any field duplicate samples collected from the first floor or basement were averaged using one-half the laboratory reporting limit for non-detects. Next, results from each sampling event were combined as a spatially weighted average. GEI visits to the Property have confirmed that the basement at 12 Morton Street has less than 7 feet of headroom, is currently used for storage only, and is unlikely to be converted to living space in the foreseeable future. The spatial average concentration therefore was calculated based on the assumption that a resident spends 4 hours per day in the basement and the remaining 20 hours per day on the first floor.

Lastly, results were averaged across the five sampling events. This temporal average was selected as the indoor air EPC. COPCs that were not detected above their respective laboratory reporting limits within 12 Morton Street were assumed to be present at one-half those reporting limits.

A summary of soil, groundwater, soil vapor, outdoor air, and indoor air EPCs used in the 12 Morton Street Risk Characterization is in Table RC-7.

4.9 Risk of Harm to Human Health

The risk of harm to human health is evaluated by combining the results of the exposure assessment and the toxicity assessment for each COPC to estimate the potential for noncarcinogenic and carcinogenic human health effects from exposure to that compound.

The total noncarcinogenic Hazard Indices (HIs) for all evaluated scenarios are at or below MassDEP's target HI of 1. These results indicate that a condition of NSR exists for non-cancer effects of current and future exposures at the Property. The total Excess Lifetime Cancer Risks (ELCRs) for all evaluated scenarios are at or below MassDEP's target risk level of 1×10^{-5}. The ELCR calculations are based on conservative exposure durations and EPC assumptions. These results indicate that a condition of NSR exists for carcinogenic effects of current and future exposures at the Property.

4.10 Risk of Harm to Safety

The risk of harm to safety was evaluated in accordance with 310 CMR 40.0960. The assessment of risk to safety evaluates the threat of fire or explosion, and the presence of corrosive, reactive, or flammable uncontained materials that are related to the contaminated media.

COPCs at the Property are not explosive, corrosive, or reactive. There are no open pits or lagoons present at the Site. Therefore, a condition of NSR to safety exists at the Property under current and future conditions.

4.11 Risk of Harm to Public Welfare

The risk of harm to public welfare was evaluated in accordance with 310 CMR 40.0994. No nuisance conditions or significant community effects associated with the Property have been reported. In addition, soil and groundwater EPCs were compared to upper concentration limits (UCLs). Groundwater and soil EPCs are below the UCLs. Therefore, a condition of NSR to public welfare exists at the Property under current and future conditions.

4.12 Risk of Harm to the Environment

The risk of harm to the environment was evaluated in accordance with MassDEP Guidance #WSC/ORS #95-141, "Guidance for Disposal Site Risk Characterization," dated July 28, 1995 and 310 CMR 40.0995. Based on the terrestrial and aquatic habitat evaluation, no "potentially significant exposures" to identified environmental receptors from COPCs likely exist, and a Stage II Environmental Risk Characterization is not necessary. Accordingly, a condition of NSR to the environment exists at the Property.

4.13 Uncertainty Analysis

Certain assumptions within the risk assessment process must be made due to a lack of absolute scientific knowledge. Some of the assumptions are supported by considerable scientific evidence, while others have less support. Every assumption introduces some degree of uncertainty into the risk assessment process. Conservative assumptions are made throughout the risk assessment to ensure that the health of local residents and the environment are protected. When all of the assumptions are combined, it is much more likely that the actual risks, if any, are over-estimated rather than under-estimated.

4.14 Conclusions

A site-specific Method 3 Risk Characterization was performed to evaluate the potential harm to human health, safety, public welfare, and the environment at the Property. The potential exposure pathways evaluated at the Site include:

- Ingestion and dermal contact with soil, and inhalation of soil-derived fugitive dust by a resident and construction worker.
- Inhalation of air in an excavation by a construction worker.
- Inhalation of indoor air and outdoor air by a resident.

The results of the Method 3 Risk Characterization (12 Morton Street Risk Characterization) demonstrate that a condition of NSR exists at the Property for current and future receptors assuming the EPEM continues to mitigate the vapor intrusion pathway, and the EPEM is maintained in accordance with the AUL that is placed on the Property.

5. Activity and Use Limitation

The EPEM installed at the Property has mitigated the exposure pathway for vapor intrusion of chlorinated VOCs into the indoor air and achieved a condition of NSR. In order to maintain a condition of NSR, the integrity of the EPEM must be preserved. Therefore, an AUL is necessary to define the restricted and permitted activities to maintain a condition of NSR. The AUL is applicable to the entire Property.

A Notice of AUL was recorded for the Property at the Middlesex South District Registry of Deeds on October 23, 2009. A copy of the Notice of AUL, including the AUL Opinion, and a copy of the MassDEP AUL Transmittal Form (BWSC113) are included in Appendix D.

The AUL includes a description of the activities and uses of the Property that are inconsistent with the objectives of the AUL, and if implemented may result in a significant risk of harm to health, safety, public welfare, or the environment. Those activities and uses include:

(i) In the basement, removal or damage of the concrete floor, the overlying elastomeric coating, the vapor barrier, the sub-slab venting system, and/or the protective stucco wall finish;

(ii) In the basement, any activities which may damage and/or compromise the concrete floor, the overlying elastomeric coating, the vapor barrier, the sub-slab venting system, and/or the protective stucco wall finish;

(iii) In the event an electric fan is added to the EPEM, removal or damage of such fan;

(iv) In the event an electric fan is added to the EPEM, shutting down, turning off, or removing electrical power to the fan, or any other activity that would make such fan inoperable;

(v) Any activities which may damage and/or compromise the ventilation piping located on the exterior of the building; and

(vi) Construction of any occupied structure at the Property without the installation of an EPEM and subsequent indoor air sampling to confirm its effectiveness in preventing or mitigating vapor intrusion into the structure.

The AUL includes obligations and conditions required to maintain a condition of NSR. Those obligations and conditions include:

(i) In the basement, the integrity of the concrete floor, the overlying elastomeric floor coating, the vapor barrier, the sub-slab venting system, and the

protective stucco wall finish of the existing building must be preserved and the elements of the EPEM must not be damaged or altered;

(ii) On the exterior of the building, the integrity of the ventilation piping must be preserved, and the elements of the piping must not be damaged or altered;

(iii) In the event an electric fan is added to the EPEM, power must be maintained to such fan and the fan may not be shut down;

(iv) In the event an electric fan is added to the EPEM, notification must be provided to UniFirst Corporation, together with its successors and assigns and/or its agents, if such fan becomes inoperable, and access must be provided to UniFirst Corporation, together with its successors and assigns and/or its agents, to repair or replace the fan as necessary;

(v) Access must be provided, at least annually, to UniFirst Corporation, together with its successors and assigns and/or its agents, to inspect the EPEM for damage and, to the extent necessary to continue the EPEM's effectiveness in preventing or mitigating vapor intrusion into the building, to conduct indoor air testing and/or repair or replace the vapor barrier, venting system, and/or electric fan (to the extent such a fan is added to the EPEM); and

(vi) Any future construction of an occupied structure at the Property must include the installation of an EPEM to prevent or mitigate vapor intrusion into the structure. The design of the EPEM must be incorporated into the design and construction of the future structure and must be evaluated by an LSP. Follow-up indoor air testing must be conducted to confirm the effectiveness of the EPEM in preventing or mitigating vapor intrusion into the structure.

6. Feasibility of Achieving Background

Contaminants at the Property have not been reduced to background. The MCP requires the results of a feasibility evaluation to be documented for a Class A-3 RAO to demonstrate that achieving or approaching background is not feasible. We conducted a benefit-cost analysis to evaluate the practicality of achieving or approaching background conditions at the Property.

There are no naturally occurring background concentrations of chlorinated VOCs in soil or groundwater. Chlorinated VOCs have not been detected in soil at the Property. For groundwater, in lieu of achieving non-detectable levels, achievement of one-half the applicable Method 1 GW-1 standard is considered acceptable to be approaching background in accordance with MassDEP Policy #WSC-04-160, “Conducting Feasibility Evaluations Under the MCP,” dated July 16, 2004.

The 12 Morton Street Risk Characterization for the Property has demonstrated that a condition of NSR exists for exposure to the residual concentrations of chlorinated VOCs in soil and groundwater under current and future uses. The costs associated with in-situ or ex-situ treatment of groundwater at the Property to approach or achieve background would not justify the gains in risk reduction because the Property has already achieved a condition of NSR and the source of the dissolved COPCs in groundwater is located upgradient of the Property.

In addition, GEI evaluated the feasibility of achieving background at the Site in the Phase II/Phase III. The cost to achieve background was disproportionate to the benefits that might accrue from extensive remedial actions, and therefore such remedial actions are not feasible. The evaluation was consistent with MassDEP’s feasibility policy (WSC-04-160), which states that approaching background for persistent or non-degradable soil contaminants in S-2 or S-3 soil can be deemed infeasible. Dense Non-Aqueous Phase Liquid (DNAPL) consisting of PCE in bedrock fractures meets the definition of a persistent contaminant and is potentially present in a portion of the Site, which is classified as S-2 and S-3. Therefore, approaching background at this Site is considered infeasible.

In accordance with the MCP (310 CMR 40.0860[7][a]), it is GEI’s opinion that further remediation to achieve or approach background is considered infeasible because the incremental cost to achieve or approach background is disproportionate to the incremental benefit of risk reduction.

7. Source Control

The source of contamination at the Property is the chlorinated VOCs associated with the shallow overburden groundwater plume at the Site. The shallow overburden groundwater plume is bounded approximately by Alston Street, Cross Street, Glen Street, Oliver Street, and Franklin Avenue in Somerville, Massachusetts (Fig. 2). The deep overburden and bedrock groundwater plumes extend beyond the eastern boundary of the shallow overburden groundwater plume, based on very low concentrations of PCE detected in groundwater collected from wells in till and bedrock.

The Phase II/Phase III demonstrated:

- The residual DNAPL (and any connected phase DNAPL) is not migrating and exists in a stable configuration because of capillary trapping forces. The stability of the DNAPL sources is consistent with the stable groundwater concentrations in monitoring wells within the area of likely DNAPL occurrence.
- The dissolved phase groundwater plumes are at steady-state across the network of monitoring wells in both the overburden and bedrock.
- The DNAPL sources and the dissolved phase groundwater plumes are stable and are not causing an increase in concentrations of VOCs in groundwater, soil, soil vapor, or indoor air.

Therefore, the source of contamination at the Property has been controlled.

8. Representativeness Evaluation and Data Usability Assessment

The purpose of a Representativeness Evaluation and Data Usability Assessment (REDUA) is to evaluate the extent to which a data set meets specific site characterization and data usability objectives. The majority of the data on which this Class A-3 RAO-P Statement relies was evaluated under the REDUA presented in the Phase II/III, which was submitted in July 2008. However, additional groundwater and indoor air samples have been collected since the Phase II/III, and the analytical results for some of those samples are included in the data set for this RAO-P Statement. A REDUA for these additional data are presented below. We performed the REDUA in general accordance with MassDEP Policy #WSC-07-350, "MCP Representativeness Evaluations and Data Usability Assessments," dated September 19, 2007.

8.1 Conceptual Site Model

The CSM is presented in Section 1.6.

8.2 Field and Screening Data

Field data include physical parameter measurements we made during groundwater sampling (e.g., pH, temperature, conductivity, dissolved oxygen, etc.). We reviewed field and screening data with the associated laboratory testing reports as part of the data quality assessment.

8.3 Sampling Rationale, Distribution, and Data Completeness

Environmental samples were submitted for chlorinated VOC testing consistent with the Site history and types of chemicals stored and used at the Site. In addition to the initial rounds of sampling conducted at the Property in March 2008, indoor air samples were collected from the basement and first floor of the building in April 2009 and in March and November 2010. These sampling locations are considered to be representative of the indoor air exposures to building occupants. To characterize the groundwater at the Property, GEI relied on groundwater monitoring well MW103. No groundwater samples have been collected from MW103 since the Phase II/III.

The analytical result for 1,4-dioxane in the groundwater sample collected on October 9, 2006 was rejected by the outside data validator due to gross exceedance of the minimum response factor criteria as specified in EPA SW846 Method 8260. However, the reported result was

not above reporting limits, and 1,4-dioxane has not been detected above reporting limits in the other groundwater samples collected from MW103. No other data out of nearly 800 data points were rejected. We did not identify any data gaps related to sample distribution or additional data gaps related to data quality. Therefore, the data set is over 99.8% complete. We did not identify inconsistent data. Field screening results and observations, such as visual and olfactory observations, were consistent with laboratory testing results. There is little uncertainty associated with the data used to support this Class A-3 RAO-P Statement given the number of samples collected and the locations at which they were collected. All data collected were considered representative.

8.4 Data Usability Assessment

Laboratory testing data used to support this Class A-3 RAO-P Statement were generated pursuant to the MassDEP Compendium of Analytical Methods (CAM) and 310 CMR 40.1056 and meet the criteria for "Presumptive Certainty" as identified in the MassDEP document "WSC No. 10-320: Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols," dated July 1, 2010.. These data also are consistent with our field observations, are representative of conditions that exist or existed at the Property, and are of a level of precision and accuracy commensurate with the preparation of this Class A-3 RAO-P Statement.

8.5 Data Usability Criteria

GEI evaluated data for the Precision Accuracy Representativeness Completeness Comparability and Sensitivity (PARCCS) parameters as part of our field procedures, our laboratories' analytical protocols, and our in-house data review and validation process. No data obtained after the July 2008 Phase II/III and used to support this Class A-3 RAO-P Statement were qualified by the laboratory. Finally, laboratory reporting limits for COPCs considered in the risk characterization were of appropriate precision.

8.6 Statement of Suitability

In summary, the data set relied upon in this Class A-3 RAO-P Statement to characterize the conditions at the Property and perform a risk characterization is scientifically valid and defensible. It is of sufficient accuracy, precision, and completeness. In addition, the data set is representative of the spatial and temporal distribution of sampling points.

9. Class A-3 Response Action Outcome Partial Statement

Based on the results of the Phase II/III prepared for the Site, and the 12 Morton Street Risk Characterization, it is the LSP's opinion that a Class A-3 RAO-P Statement is appropriate for the Property because:

- Remedial actions were conducted and a Permanent Solution has been achieved.
- A condition of NSR to human health, safety, public welfare, and the environment exists for all receptors.
- An AUL is required to maintain a condition of NSR.
- OHM at the Property do not exceed applicable UCLs in soil or groundwater.

This Class A-3 RAO-P Statement is a partial RAO because it only applies to the lateral limits of the Property shown in Fig. 2.

9.1 Operation, Maintenance, and/or Monitoring

GEI will conduct periodic inspections of the EPEM to confirm the integrity of the vapor barrier system and ventilation piping. In addition, an EPEM warning label has been installed in plain view on EPEM system components (Appendix E). The label provides building occupants with GEI contact information in the event that the EPEM components are compromised.

10. Limitations

The conclusions provided by GEI in this report are based solely on the information reported in this document. Additional information which was not available to GEI may result in a modification of the conclusions stated above. This report has been prepared in accordance with generally accepted hydrogeological practices. In the event that a MassDEP audit is conducted, it is the responsibility of UniFirst Corporation, and not GEI, to respond to the MassDEP Notice of Audit Findings. No warranty, expressed or implied, is made.

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Geotechnical
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Tables

Table 1
Chemical Testing Results - Groundwater
12 Morton Street
Somerville, Massachusetts

		Sample Location:	MW103					
		Sample Name:	**MW-103**	**MW103**	**MW103**	**MW-103**	**MW103**	**MW103**
		Well Screen Interval (ft bgs):	**6 to 16**	**6 to 16**	**6 to 16**	**6 to 16**	**6 to 16**	**6 to 16**
		Sample Date:	**5/24/06**	**8/7/06**	**10/5/06**	**1/16/07**	**1/18/07**	**4/13/07**
		Collected By:	**GEI**	**GEI**	**GEI**	**GEI**	**GEI**	**GEI**
Analyte	**Method**	**Units**						
Volatile Organic Compounds (VOCs)								
Chloroform			< 1.0	< 1.0	< 1.0	0.65 J	0.62 J	< 5.0
1,1-Dichloroethane			27.2	3.7	13.0	11.5	10.1	7.9
1,1-Dichloroethylene			13.4	2.0	6.5	4.3	4.3	8.0
cis-1,2-Dichloroethylene			< 1.0	3.0	2.5	< 1.0	< 1.0	< 5.0
1,4-Dioxane[6]			< 25	< 25	< 25 R	< 25	< 25	< 130
Methyl tert-butyl ether[6]			< 1.0	< 1.0	0.65 J J+	< 1.0	< 1.0	< 5.0
1,1,1,2-Tetrachloroethane[6]			< 5.0	< 5.0	< 5.0	< 5.0 F+	< 5.0	< 25
Tetrachloroethylene (PCE)			2600	592	1510	1200 F+	1250 F-	1510
1,1,1-Trichloroethane (TCA)			34.0	4.4	14.4 J+	17.6	21.0	< 5.0
Trichloroethylene (TCE)			109	24.0	60.4	37.0	38.0	58.7
Metals	6010B	µg/l	NT	NT	NT	NT		NT
Arsenic							< 10	
Iron							< 100	
Manganese							NT	
Others			NT	NT	NT	NT		NT
Methane	8015	µg/l					< 10	
Ethane	8015	µg/l					< 10	
Ethylene	8015	µg/l					< 10	
Alkalinity	E310.1	µg/l					53500	
Chloride	E325.3	µg/l					675000	
Chlorine, Total Residual	E330.4	µg/l					NT	
Nitrate & Nitrite as N	E353.2	µg/l					8900	
Nitrogen, Nitrate	E353.2	µg/l					8900	
Nitrogen, Nitrite	E354.1	µg/l					16	
Sulfate	E375.4	µg/l					65700	
Sulfide	E376.1	µg/l					< 2000	
Surfactants	E425.1	µg/l					< 100	
Total Organic Carbon	E415.1	µg/l					1700	

General Notes:

1. Analytes detected in at least one sample are reported here. For a complete list of analytes refer to the laboratory data reports.
2. ft bgs = feet below ground surface.
3. µg/l = micrograms per liter.
4. "<" = The analyte was not detected at a concentration above the specified reporting limit.
5. NT = Not Tested.
6. Analyte is not associated with the release of chlorinated VOCs at the Site, and is therefore not a compound of potential concern (COPC). Refer to Section 4.6 of this Response Action Outcome report.

Qualifying Notes:

F+ The result has a high bias due to matrix spike recovery above upper control limits.
F- The result has a low bias due to matrix spike recovery below lower control limits.
J The reported result is below the laboratory reporting limit and is estimated.
J+ The reported result is estimated.
R The result is rejected due to gross exceedence of minimum response factor criteria.

Table 2
Chemical Testing Results - Sub-Slab Soil Vapor
12 Morton Street
Somerville, Massachusetts

	Sample Location:	**12 Morton Street**	
	Sample Name:	**12MORT-SS1**	
	Sample Date:	**5/29/07**	
	Units:	**$\mu g/m^3$**	**ppbv**
Analyte	**Method**		
Volatile Organic Compounds (VOCs)	TO-15		
Tetrachloroethylene (PCE)		1010	149

General Notes:

1. In general, analytes detected in at least one sample are reported here. For a complete list of analytes see the attached laboratory data sheets.
2. $\mu g/m^3$ = micrograms per cubic meter.
3. ppbv = parts per billion by volume.

Table 3
Chemical Testing Results - Indoor Air
12 Morton Street
Somerville, Massachusetts

	Sample Location:	12 Morton Street															
	Sample Name:	12MORT-1A		12MORT-1B		12MORT-B1		12MORT-B2		12MORT-1A		12MORT-1B		12MORT-B1		12MORT-B2	
	Sample Date:	3/5/08		3/5/08		3/5/08		3/5/08		3/21/08		3/21/08		3/21/08		3/21/08	
	Sampling Duration:	4-Hour		4-Hour		4-Hour		4-Hour		4-Hour		4-Hour		4-Hour		4-Hour	
	Units:	µg/m^3	ppbv	µg/m^3	ppbv	µg/m^3	ppbv	µg/m^3	ppbv	µg/m^3	ppbv	µg/m^3	ppbv	µg/m^3	ppbv	µg/m^3	ppbv
Analyte	**Method**																
Volatile Organic Compounds (VOCs)	TO-15																
Carbon tetrachloride[5]		0.62 J	0.099 J	< 1.3	< 0.20	< 1.3	< 0.20	< 1.3	< 0.20	0.62 J	0.099 J	0.75 J	0.12 J	< 1.3	< 0.20	0.60 J	0.095 J
Tetrachloroethylene (PCE)		< 1.4	< 0.20	< 1.4	< 0.20	< 1.4	< 0.20	< 1.4	< 0.20	< 1.4	< 0.20	< 1.4	< 0.20	< 1.4	< 0.20	< 1.4	< 0.20

General Notes:

1. Analytes detected in at least one sample are reported here. For a complete list of analytes see the attached laboratory data sheets.
2. µg/m^3 = micrograms per cubic meter.
3. ppbv = parts per billion by volume.
4. "<" = The analyte was not detected at a concentration above the specified laboratory reporting limit.
5. Analyte is not associated with the release of chlorinated VOCs at the Site, and is therefore not a compound of potential concern (COPC). Refer to Section 4.5 of this Response Action Outcome report.
6. On 3/05/08 and 3/21/08 two duplicate samples were taken from the 1st Floor (1A and 1B) and two from the basement (B1 and B2).
7. No pre-EPEM indoor air samples were collected. The EPEM was installed based on sub-slab soil vapor testing results.

Qualifying Note:

J The reported result is below the laboratory reporting limit and is estimated.

Table 3
Chemical Testing Results - Indoor Air
12 Morton Street
Somerville, Massachusetts

	Sample Location:	**12 Morton Street (continued)**											
	Sample Name:	**12MORT-1**		**12MORT-B**		**12MORT-1**		**12MORT-B**		**12MORT-1**		**12MORT-B**	
	Sample Date:	**4/3/09**		**4/3/09**		**3/9/10**		**3/9/10**		**11/19/10**		**11/19/10**	
	Sampling Duration:	**4-Hour**		**4-Hour**		**24-Hour**		**24-Hour**		**24-Hour**		**24-Hour**	
	Units:	**$\mu g/m^3$**	**ppbv**	**$\mu g/m^3$**	**ppbv**	**$\mu g/m^3$**	**ppbv**	**$\mu g/m^3$**	**ppbv**	**$\mu g/m^3$**	**ppbv**	**$\mu g/m^3$**	**ppbv**
Analyte	**Method**												
Volatile Organic Compounds (VOCs)	TO-15												
Carbon tetrachloride[5]		< 1.3	< 0.20	< 1.3	< 0.20	< 1.3	< 0.20	< 1.3	< 0.20	NT	NT	NT	NT
Tetrachloroethylene (PCE)		< 1.4	< 0.20	< 1.4	< 0.20	< 1.4	< 0.20	1.4	0.21	< 1.4	< 0.20	< 1.4	< 0.20

General Notes:

1. Analytes detected in at least one sample are reported here. For a complete list of analytes see the attached laboratory data sheets.
2. $\mu g/m^3$ = micrograms per cubic meter.
3. ppbv = parts per billion by volume.
4. "<" = The analyte was not detected at a concentration above the specified laboratory reporting limit.
5. Analyte is not associated with the release of chlorinated VOCs at the Site, and is therefore not a compound of potential concern (COPC). Refer to Section 4.5 of this Response Action Outcome report.
6. On 3/05/08 and 3/21/08 two duplicate samples were taken from the 1st Floor (1A and 1B) and two from the basement (B1 and B2).
7. No pre-EPEM indoor air samples were collected. The EPEM was installed based on sub-slab soil vapor testing results.

Qualifying Note:

J The reported result is below the laboratory reporting limit and is estimated.

Table 4
Chemical Testing Results - Soil
12 Morton Street
Somerville, Massachusetts

		Location Name:	**12 Morton Street**
		Sample Depth (feet):	**0-3**
		Sample Name:	**SOUTHSOIL-0-3**
		Sample Date:	**1/11/2008**
Analyte	**Method**	**Units**	
Volatile Organic Compounds (VOCs)	SW 8260B	mg/kg	
Total VOCs			ND
Semi-Volatile Organic Compounds (SVOCs)	SW 8270C	mg/kg	
Butyl benzyl phthalate			0.041 J
Di-n-butyl phthalate			1.78
bis (2-Ethylhexyl)phthalate			0.0515 J
Extractable Petroleum Hydrocarbons (EPH)	MADEP EPH	mg/kg	
C9-C19 Aliphatics	REV 1.1		34.8
C19-C36 Aliphatics			11
Polychlorinated Biphenyls (PCBs)	SW 8082	mg/kg	ND
Metals		mg/kg	
Arsenic	SW 6010B		3.8
Chromium	SW 6010B		15.8
Lead	SW 6010B		9.6
Mercury	SW 7471A		0.21
Other			
Solids, Percent	SM21 2540B MOD	%	91.6
Specific Conductivity	EPA 120.1M	umhos/cm	2360
pH	SW846 CHAP 7	su	8.5

General Notes:

1. In general, only analytes detected in at least one sample are reported here.
   For a complete list of analytes see the laboratory data sheets.
2. "<" = The analyte was not detected at a concentration above the specified reporting limit.
3. mg/kg = milligrams per kilogram.
4. umhos/cm = micro-ohms per centimeter.
5. su = standard units.
6 ND = No analytes tested in this method were detected above laboratory reporting limits.

Qualifying Note:

J The reported result is below the laboratory reporting limit and is estimated.

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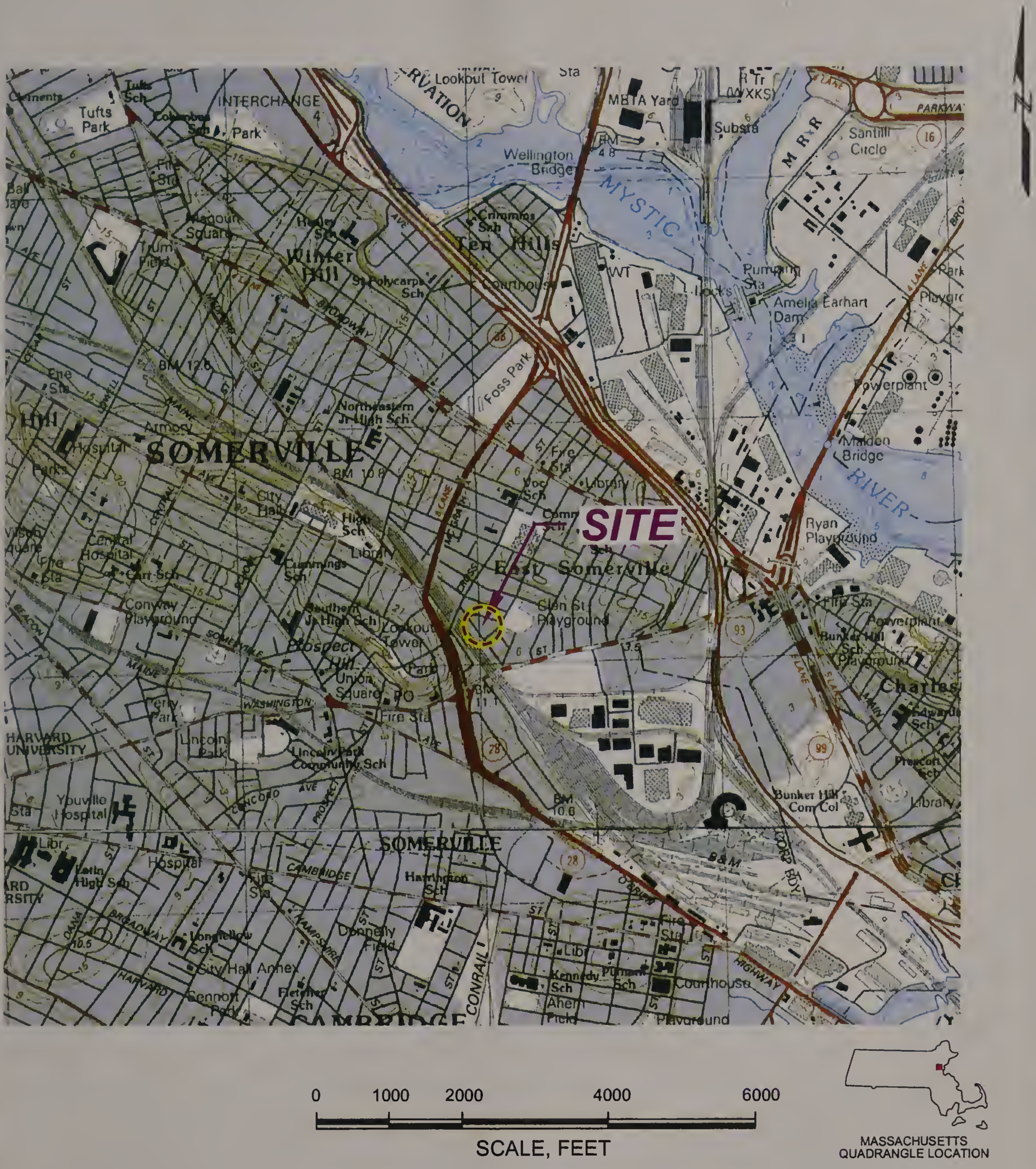
Geotechnical
Environmental
Water Resources
Ecological

MassDEP RTN 3-23246
Class A-3 Response Action Outcome Partial Statement
for 12 Morton Street, Somerville, Massachusetts
50 Tufts Street Site, Somerville, Massachusetts
UniFirst Corporation
October 21, 2011

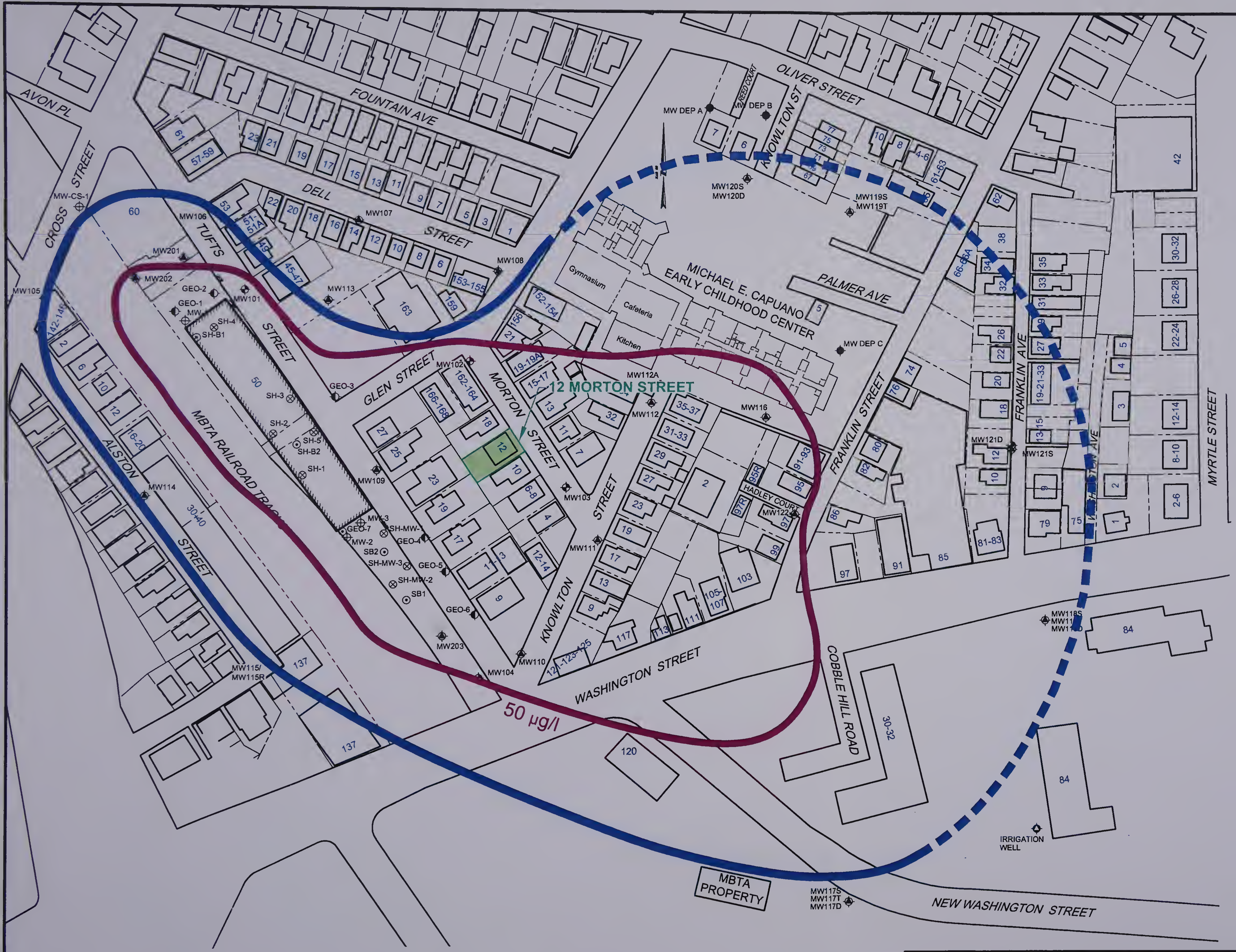
Figures



This Image provided by MassGIS is taken from
U.S.G.S. Topographic 7.5 X 15 Minute Series
Boston North, MA Quadrangle, 1985.
Datum is National Geodetic Vertical Datum (NGVD 1929).
Contour Interval is 3 Meters.

Class A-3 Response Action Outcome Partial Statement 50 Tufts Street Somerville, Massachusetts	GEI Consultants	SITE LOCATION MAP
UniFirst Corporation Wilmington, Massachusetts	Project 04516-3	October 2011 Fig. 1

N:\04516\#Drafting\04516-3\Partial RAOs\12 Morton St\045160-3-RAOP-01 12 Morton



LEGEND:

- MONITORING WELL WITH SOIL VAPOR SAMPLE PORT INSTALLED BY GEI, JANUARY 2007 - JANUARY 2008
- ⊗ MONITORING WELL INSTALLED BY SANBORN HEAD ASSOCIATES, 2002
- MONITORING WELL INSTALLED BY GEOINSIGHT, JUNE 2004
- ⊙ SOIL BORING ADVANCED BY GEOINSIGHT, AUGUST 2004
- MONITORING WELL INSTALLED BY GEI, MAY 2006
- ● DRIVEN POINT MONITORING WELL INSTALLED BY MADEP, MAY 2007
- ⊕ MONITORING WELL INSTALLED PREVIOUSLY, DATE UNKNOWN
- PREVIOUSLY INSTALLED IRRIGATION WELL
- 84 STREET ADDRESS
- MBTA = MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
- 🟦 DISPOSAL SITE BOUNDARY (DASHED WHERE INFERRED)
- 🟥 EXTENT OF PCE CONCENTRATION IN SHALLOW GROUNDWATER GREATER THAN OR EQUAL TO 50 MICROGRAMS PER LITER (µg/l)
- 🟩 PORTION OF SITE SUBJECT TO THE CLASS A-3 PARTIAL RAO

GENERAL NOTES:

1. HORIZONTAL CONTROL FOR THIS PLAN WAS ESTABLISHED BY GPS AND IS BASED ON THE NORTH AMERICAN DATUM OF 1983.
2. STREET AND PROPERTY LINES BASED ON SOMERVILLE ASSESSORS' MAPS AND ARE BEST FIT RELATIVE TO THE LOCATION OF THE 50 TUFTS ST. BUILDING.
3. MONITORING WELL LOCATIONS WERE ESTABLISHED BASED ON THE GROUND SURVEYS BY BSC GROUP, INC.
4. GEI OBSERVED ABANDONMENT OF SH-MW1 AND SH-1 THROUGH SH-5 IN 2007.

0 150 300
SCALE, FEET

Class A-3 Response Action Outcome Partial Statement
50 Tufts Street
Somerville, Massachusetts

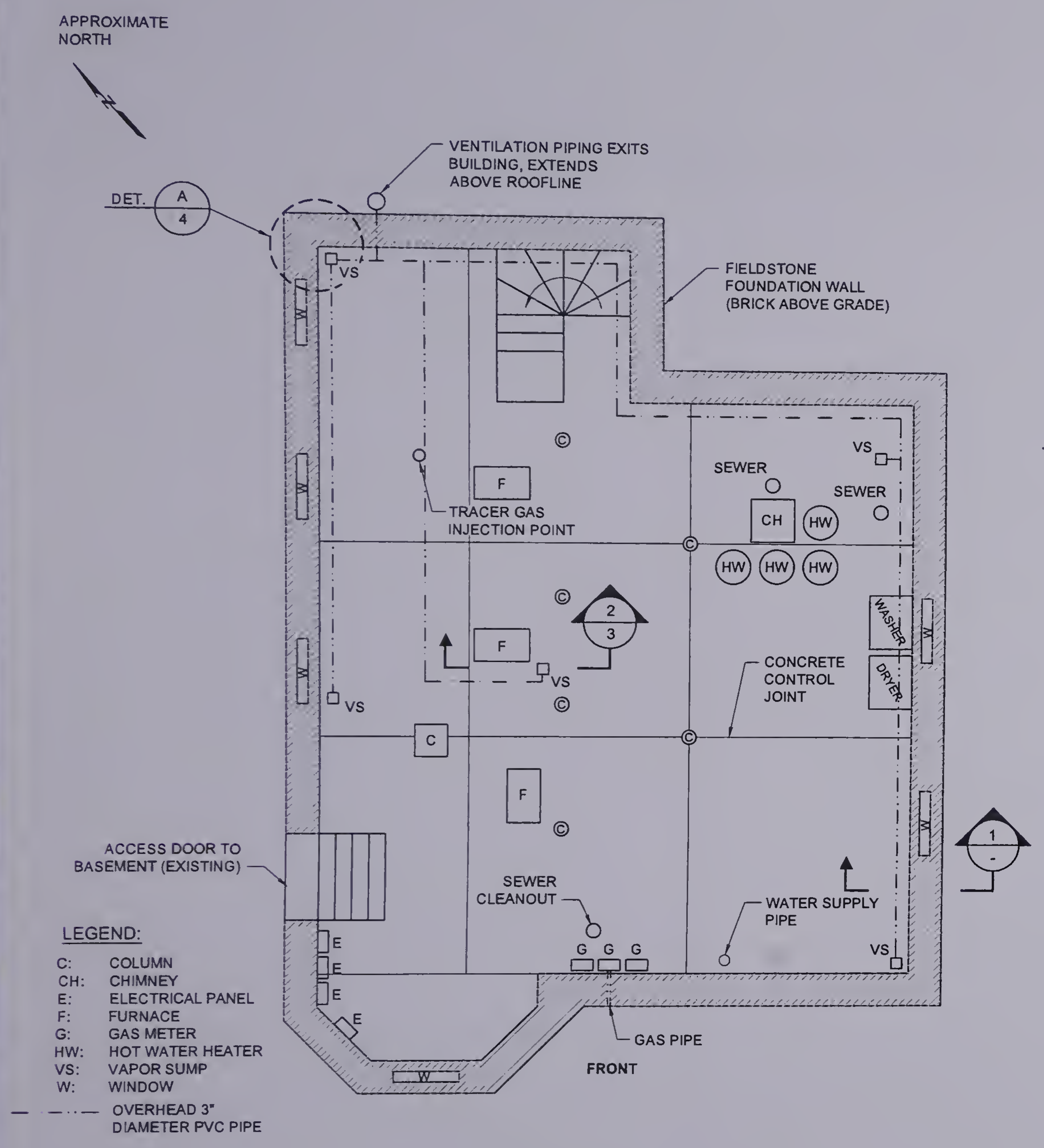
UniFirst Corporation
Wilmington, Massachusetts

GEI Consultants

12 MORTON STREET - PORTION OF DISPOSAL SITE SUBJECT TO CLASS A-3 RAO

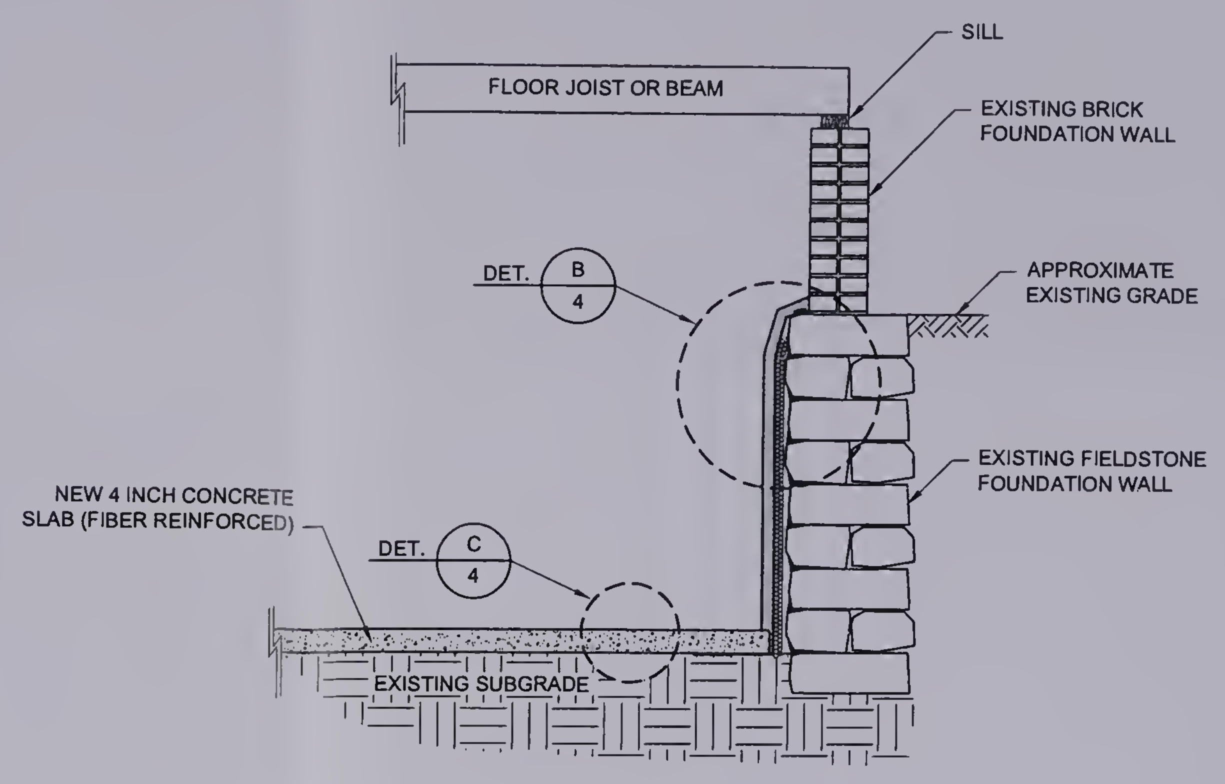
Project 04516-3 | October 2011 | Fig. 2

N:\04516\#Drafting\04516-3\Partial RAOs\12 Morton St\045160-3-RAOP-02 12 Morton



BASEMENT

1/4" = 1'-0"


SILL
FLOOR JOIST OR BEAM
EXISTING BRICK FOUNDATION WALL
DET. B 4
APPROXIMATE EXISTING GRADE
EXISTING FIELDSTONE FOUNDATION WALL
NEW 4 INCH CONCRETE SLAB (FIBER REINFORCED)
DET. C 4
EXISTING SUBGRADE

SECTION 1 -

3/4" = 1'-0"

SPECIFICATIONS:

1) CONCRETE: IN ACCORDANCE WITH ACI 301 "SPECIFICATION FOR STRUCTURAL CONCRETE"
    - A) MINIMUM COMPRESSIVE STRENGTH (F'C) (ASTM C39): 3000 PSI @ 28 DAYS
    - B) PORTLAND CEMENT (ASTM C150): TYPE II OR IIA
    - C) MAXIMUM WATER-TO-CEMENT RATIO BY WEIGHT: 0.50
    - D) AGGREGATE (ASTM C33): 3/8-INCH NOMINAL MAXIMUM SIZE
    - E) SLUMP (ASTM C143): 3 INCHES TO 5 INCHES
    - F) AIR CONTENT: 7.0%, +/- 1.5%
    - G) PERMITTED ADMIXTURES: AIR ENTRAINING, FIBER REINFORCEMENT

2) CONCRETE FINISHING: FLOAT FINISH. CONTROL JOINTS INSTALLED EVERY 4' ON WALL AND 8' ON CENTER FOR FLOOR

3) SOLID PVC PIPE: ASTM D1785, SCHEDULE 40

4) PERFORATED PVC PIPE: ASTM D2729

5) CRUSHED STONE: MASSACHUSETTS HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, 1988 EDITION, SECTION M2.01.4 (3/4-INCH NOMINAL SIZE); GRADATION RECAPITULATED BELOW:

SIEVE SIZE	PERCENT PASSING BY WEIGHT
1 INCH	100
¾ INCH	90-100
½ INCH	10-50
⅜ INCH	0-20
NO. 4	0-5

6) WALL GEOCOMPOSITE: TENAX TENDRAIN DOUBLE-SIDED

7) FLOOR GEOCOMPOSITE: TENAX ROCK-IN-ROLL 7100-2 DOUBLE SIDED

8) FILTER FABRIC: 12 OZ. POLYPROPYLENE NON-WOVEN GEOTEXTILE

9) STUCCO: CEMENTITIOUS STUCCO FOR FIRST COAT, TWO-PART ELASTOMERIC STUCCO FOR SECOND COAT, APPLIED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. FINISHED TOTAL THICKNESS INCLUDING ALL COATS: 1 INCH, ± ⅛ INCH.

10) LATH: 3.4 POUNDS PER SQUARE YARD WEIGHT, MINIMUM 6" OVERLAP

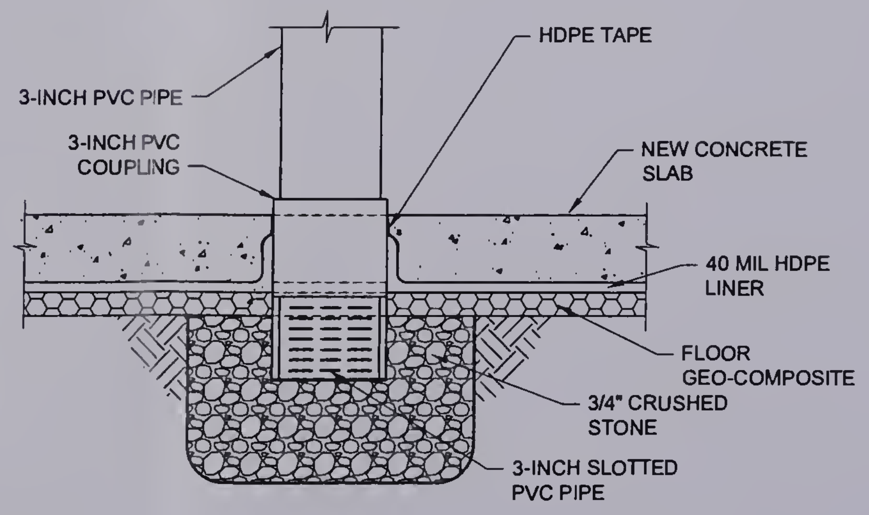
11) PERM-A-BARRIER: W.R. GRACE & CO. PERM-A-BARRIER WALL MEMBRANE

12) MASTIC: W.R. GRACE & CO. BITUTHENE MASTIC

13) WIND DRIVEN ROTARY VENTILATOR: 4-INCH STAINLESS STEEL, 50CFM @ 4 MPH WIND

NOTES:

1. SITE PLAN BASED ON GEI FIELD MEASUREMENTS AND CITY OF SOMERVILLE TAX CARDS.
2. HEIGHT OF FIELD STONE WALLS VARIABLE TO WITHIN 0.5 FEET.
3. FURNACE, CHIMNEY, AND EXISTING SUPPORT COLUMNS WERE NOT RELOCATED.
4. THIS DRAWING HAS BEEN APPROVED BY A MASSACHUSETTS PROFESSIONAL CIVIL ENGINEER FOR THE EXCAVATION OF SOIL TO ALLOW FOR INSTALLATION OF A 4 INCH CONCRETE SLAB WITH FIBER ADMIXTURE, 40 MIL HDPE VAPOR BARRIER, AND A VOID-MAINTAINING DRAINAGE GEOCOMPOSITE TO PROVIDE A SUPPORTIVE LAYER, CAPILLARY BREAK AND VAPOR TRANSMISSION LAYER BENEATH THE HDPE VAPOR BARRIER.
5. CONSTRUCTION DETAILS ILLUSTRATED IN THIS DRAWING WILL BE INSTALLED UNDER SUPERVISION OF A MASSACHUSETTS LICENSED CONSTRUCTION SUPERVISOR.



SECTION - VENT PIPE PENETRATION THRU NEW BASEMENT FLOOR SLAB 2 -

VAPOR SUMP

NOT TO SCALE

Class A-3 Response Action Outcome Partial Statement
50 Tufts Street
Somerville, Massachusetts

UniFirst Corporation
Wilmington, Massachusetts

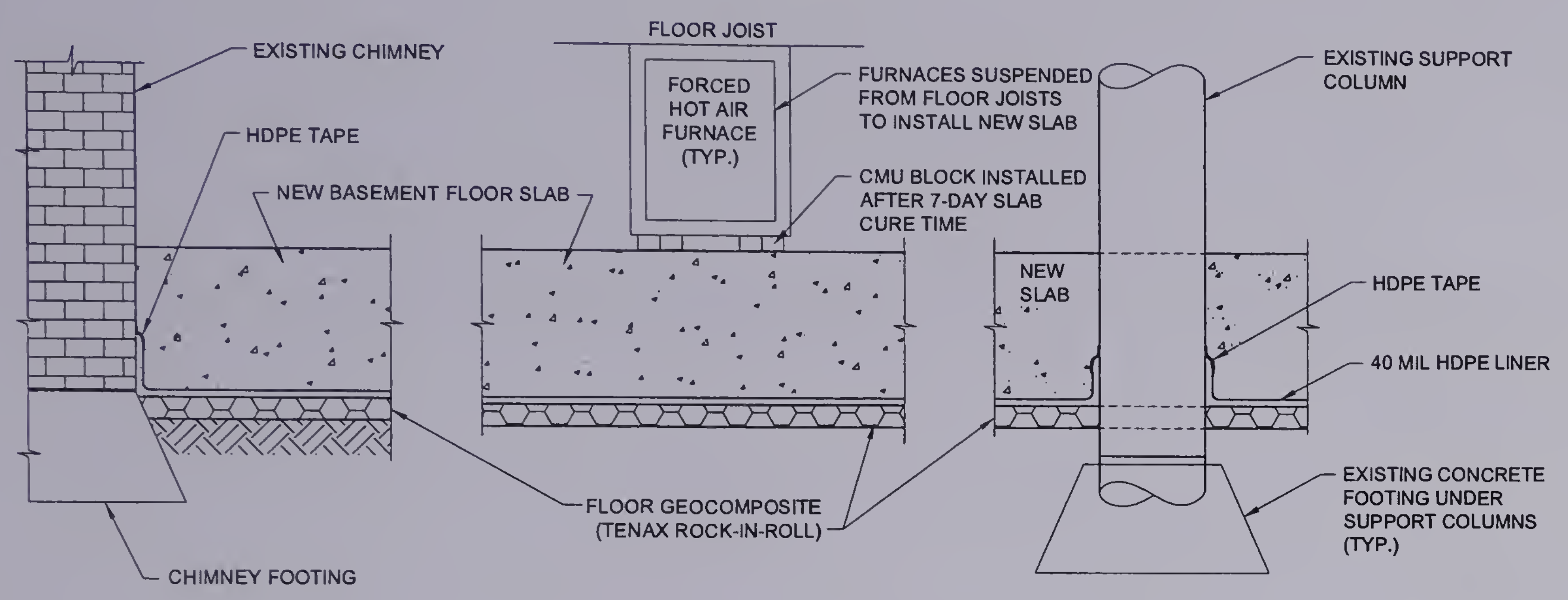
GEI Consultants

Project 04516-3

12 MORTON STREET -
EXPOSURE PATHWAY
ELIMINATION MEASURE
DETAILS

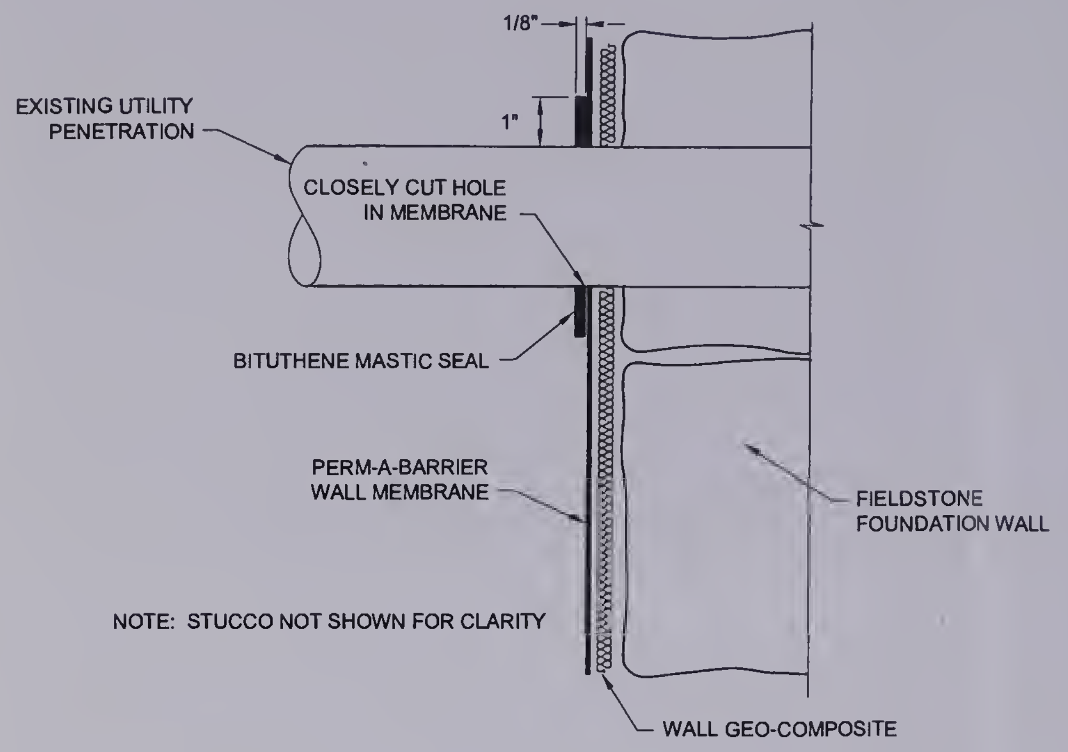
October 2011

Fig. 3


EXISTING CHIMNEY
HDPE TAPE
NEW BASEMENT FLOOR SLAB
FLOOR JOIST
FORCED HOT AIR FURNACE (TYP.)
FURNACES SUSPENDED FROM FLOOR JOISTS TO INSTALL NEW SLAB
CMU BLOCK INSTALLED AFTER 7-DAY SLAB CURE TIME
EXISTING SUPPORT COLUMN
NEW SLAB
HDPE TAPE
40 MIL HDPE LINER
FLOOR GEOCOMPOSITE (TENAX ROCK-IN-ROLL)
EXISTING CONCRETE FOOTING UNDER SUPPORT COLUMNS (TYP.)
CHIMNEY FOOTING

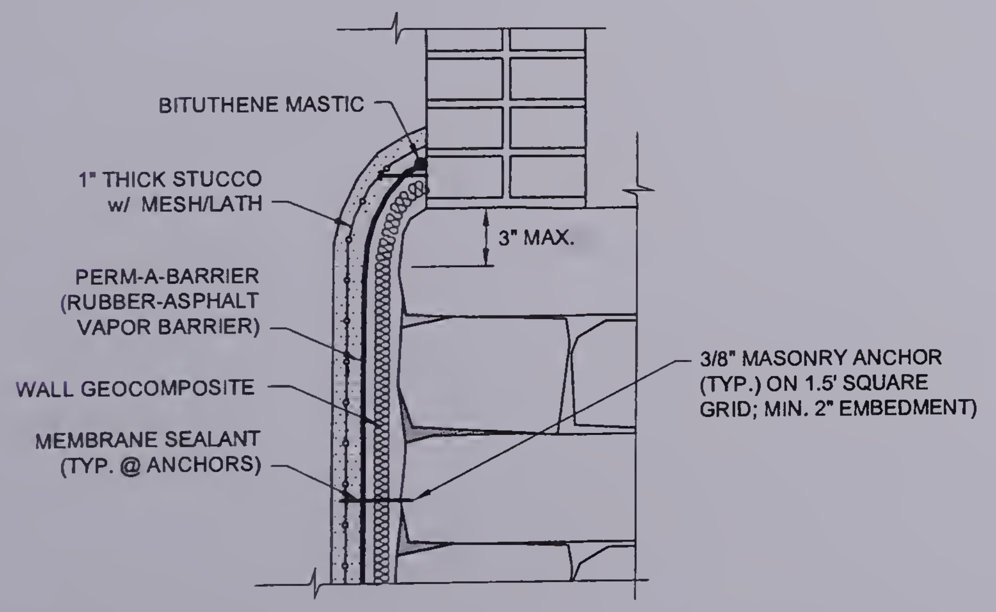
DETAIL - BASEMENT SLAB VAPOR BARRIER SYSTEM C/3

NOT TO SCALE


1/8"
1"
EXISTING UTILITY PENETRATION
CLOSELY CUT HOLE IN MEMBRANE
BITUTHENE MASTIC SEAL
PERM-A-BARRIER WALL MEMBRANE
FIELDSTONE FOUNDATION WALL
NOTE: STUCCO NOT SHOWN FOR CLARITY
WALL GEO-COMPOSITE

DETAIL - EXISTING UTILITY PENETRATION AT FIELDSTONE FOUNDATION WALL

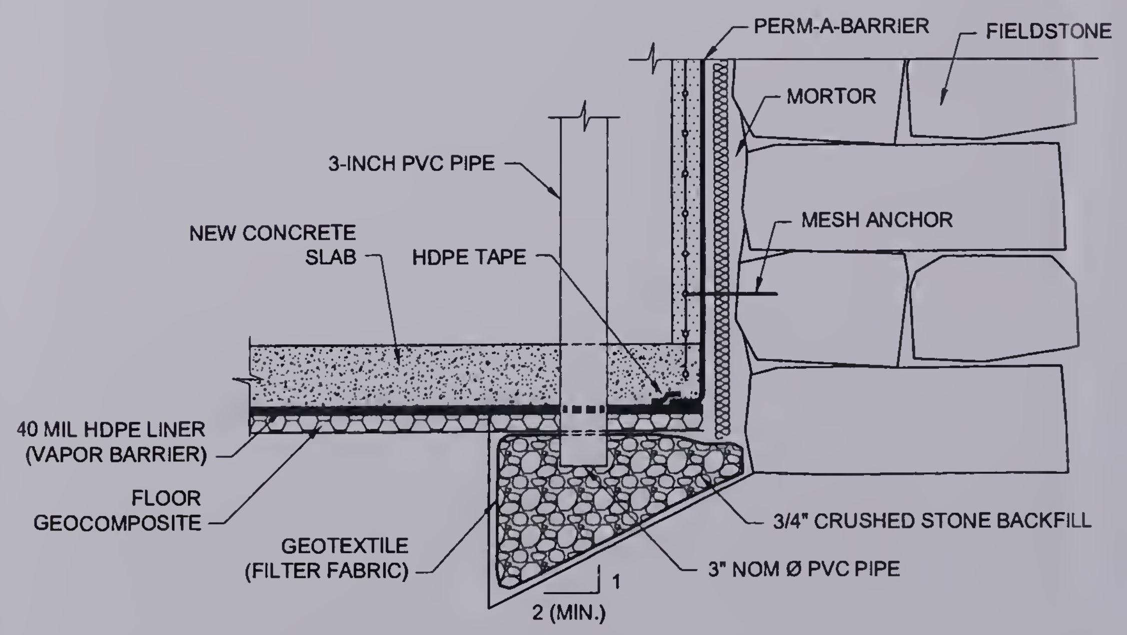
NOT TO SCALE


BITUTHENE MASTIC
1" THICK STUCCO w/ MESH/LATH
3" MAX.
PERM-A-BARRIER (RUBBER-ASPHALT VAPOR BARRIER)
WALL GEOCOMPOSITE
MEMBRANE SEALANT (TYP. @ ANCHORS)
3/8" MASONRY ANCHOR (TYP.) ON 1.5' SQUARE GRID; MIN. 2" EMBEDMENT)

DETAIL B/3

FIELD STONE FOUNDATION WALL BARRIER SYSTEM

NOT TO SCALE



DETAIL A/3

VAPOR SUMP

NOT TO SCALE

Class A-3 Response Action Outcome Partial Statement
50 Tufts Street
Somerville, Massachusetts

UniFirst Corporation
Wilmington, Massachusetts

GEI Consultants

12 MORTON STREET - EXPOSURE PATHWAY ELIMINATION MEASURE DETAILS

Project 04516-3

October 2011

Fig. 4

GEI Consultants

Geotechnical
Environmental
Water Resources
Ecological

Appendix A

MassDEP Transmittal Form (BWSC-104) “Response Action Outcome (RAO) Statement”

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC104

RESPONSE ACTION OUTCOME (RAO) STATEMENT

Pursuant to 310 CMR 40.1000 (Subpart J)

Release Tracking Number: 3 - 23246

For sites with multiple RTNs, enter the Primary RTN above.

A. SITE LOCATION:

1. Site Name/Location Aid: 50 TUFTS ST & PROP ACROSS THE ST

2. Street Address: 50 TUFTS ST

3. City/Town: SOMERVILLE

4. ZIP Code: 021454129

☑ 5. Check here if a Tier Classification Submittal has been provided to DEP for this disposal site.

☐ a. Tier IA ☐ b. Tier IB ☑ c. Tier IC ☐ d. Tier II

6. If a Tier I Permit has been issued, provide Permit Number: W085813

B. THIS FORM IS BEING USED TO: (check all that apply)

1. List Submittal Date of RAO Statement (if previously submitted): mm/dd/yyyy

☐ 2. Submit a **Response Action Outcome (RAO) Statement**

☐ a. Check here if this RAO Statement covers additional Release Tracking Numbers (RTNs). RTNs that have been previously linked to a Tier Classified Primary RTN do not need to be listed here.

b. Provide additional Release Tracking Number(s) covered by this RAO Statement. - -

☐ 3. Submit a **Revised Response Action Outcome Statement**

☐ a. Check here if this Revised RAO Statement covers additional Release Tracking Numbers (RTNs), not listed on the RAO Statement or previously submitted Revised RAO Statements. RTNs that have been previously linked to a Tier Classified Primary RTN do not need to be listed here.

b. Provide additional Release Tracking Number(s) covered by this RAO Statement. - -

☑ 4. Submit a **Response Action Outcome Partial (RAO-P) Statement**

Check above box, if any Response Actions remain to be taken to address conditions associated with this disposal site having the Primary RTN listed in the header section of this transmittal form. This RAO Statement will record only an RAO-Partial Statement for that RTN. A final RAO Statement will need to be submitted that references all RAO-Partial Statements and, if applicable, covers any remaining conditions not covered by the RAO-Partial Statements.

Also, specify if you are an Eligible Person or Tenant pursuant to M.G.L. c. 21E s.2, and have no further obligation to conduct response actions on the remaining portion(s) of the disposal site:

☐ a. Eligible Person ☐ b. Eligible Tenant

☐ 5. Submit an optional **Phase I Completion Statement** supporting an RAO Statement

☐ 6. Submit a **Periodic Review Opinion evaluating the status of a Temporary Solution** for a Class C-1 RAO Statement, as specified in 310 CMR 40.1051 (Section F is optional)

☐ 7. Submit a **Retraction** of a previously submitted **Response Action Outcome Statement** (Sections E & F are not required)

(All sections of this transmittal form must be filled out unless otherwise noted above)

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC104

RESPONSE ACTION OUTCOME (RAO) STATEMENT

Pursuant to 310 CMR 40.1000 (Subpart J)

Release Tracking Number
3 - 23246

C. DESCRIPTION OF RESPONSE ACTIONS: (check all that apply; for volumes, list cumulative amounts)

☐ 1. Assessment and/or Monitoring Only
☐ 3. Deployment of Absorbent or Containment Materials
☑ 5. Structure Venting System
☐ 7. Product or NAPL Recovery
☐ 9. Groundwater Treatment Systems
☐ 11. Bioremediation
☐ 13. Monitored Natural Attenuation
☐ 2. Temporary Covers or Caps
☐ 4. Treatment of Water Supplies
☐ 6. Engineered Barrier
☐ 8. Fencing and Sign Posting
☐ 10. Soil Vapor Extraction
☐ 12. Air Sparging
☐ 14. In-situ Chemical Oxidation

☑ 15. Removal of Contaminated Soils

☑ a. Re-use, Recycling or Treatment ☐ i. On Site Estimated volume in cubic yards

☑ ii. Off Site Estimated volume in cubic yards 10

iia. Facility Name: AMERICA RECLAMATION COR Town: CHARLTON State: MA

iib. Facility Name: Town: State:

iii. Describe:

☐ b. Landfill

☐ i. Cover Estimated volume in cubic yards

Facility Name: Town: State:

☐ ii. Disposal Estimated volume in cubic yards

Facility Name: Town: State:

☐ 16. Removal of Drums, Tanks or Containers:

a. Describe Quantity and Amount:

b. Facility Name: Town: State:

c. Facility Name: Town : State:

☐ 17. Removal of Other Contaminated Media:

a. Specify Type and Volume:

b. Facility Name: Town: State:

c. Facility Name: Town: State:

C. DESCRIPTION OF RESPONSE ACTIONS (cont.): (check all that apply; for volumes, list cumulative amounts)

☐ 18. Other Response Actions:

Describe:

☐ 19. Use of Innovative Technologies:

Describe:

D. SITE USE:

1. Are the response actions that are the subject of this submittal associated with the *redevelopment, reuse* or the *major expansion of the current use* of property(ies) impacted by the presence of oil and/or hazardous materials?

☐ a. Yes ☑ b. No ☐ c. Don't know

2. Is the property a *vacant* or *under-utilized commercial* or *industrial* property ("a brownfield property")?

☐ a. Yes ☑ b. No ☐ c. Don't know

3. Will funds from a state or federal brownfield incentive program be used on one or more of the property(ies) within the disposal site?

☐ a. Yes ☑ b. No ☐ c. Don't know If Yes, identify program(s):

4. Has a Covenant Not to Sue been obtained or sought?

☐ a. Yes ☑ b. No ☐ c. Don't know

5. Check all applicable categories that apply to the person making this submittal: ☐ a. Redevelopment Agency or Authority

☐ b. Community Development Corporation ☐ c. Economic Development and Industrial Corporation

☐ d. Private Developer ☐ e. Fiduciary ☐ f. Secured Lender ☐ g. Municipality

☐ h. Potential Buyer (non-owner) ☑ i. Other, describe: OTHER PRP

This data will be used by MassDEP for information purposes only, and does not represent or create any legal commitment, obligation or liability on the part of the party or person providing this data to MassDEP.

E. RESPONSE ACTION OUTCOME CLASS:

Specify the Class of Response Action Outcome that applies to the disposal site, or site of the Threat of Release. Select **ONLY** one Class.

☐ **1. Class A-1 RAO**: Specify one of the following:

☐ a. Contamination has been reduced to background levels. ☐ b. A Threat of Release has been eliminated.

☐ **2. Class A-2 RAO**: You **MUST** provide justification that reducing contamination to or approaching background levels is infeasible.

☑ **3. Class A-3 RAO**: You **MUST** provide an implemented Activity and Use Limitation (AUL) and justification that reducing contamination to or approaching background levels is infeasible.

☐ **4. Class A-4 RAO**: You **MUST** provide an implemented AUL, justification that reducing contamination to or approaching background levels is infeasible, and justification that reducing contamination to less than Upper Concentration Limits (UCLs) 15 feet below ground surface or below an Engineered Barrier is infeasible. If the Permanent Solution relies upon an Engineered Barrier, you must provide or have previously provided a Phase III Remedial Action Plan that justifies the selection of the Engineered Barrier.

E. RESPONSE ACTION OUTCOME CLASS (cont.):

☐ **5. Class B-1 RAO: Specify one of the following:**

☐ a. Contamination is consistent with background levels ☐ b. Contamination is **NOT** consistent with background levels.

☐ **6. Class B-2 RAO**: You **MUST** provide an implemented AUL.

☐ **7. Class B-3 RAO**: You **MUST** provide an implemented AUL and justification that reducing contamination to less than Upper Concentration Limits (UCLs) 15 feet below ground surface is infeasible.

☐ **8. Class C-1 RAO**: You must submit a plan as specified at 310 CMR 40.0861(2)(h). Indicate type of ongoing response actions.

☐ a. Active Remedial System ☐ b. Active Remedial Monitoring Program ☐ c. None

☐ d. Other Specify:

☐ **9. Class C-2 RAO**: You must hold a valid Tier I Permit or Tier II Classification to continue response actions toward a Permanent Solution.

F. RESPONSE ACTION OUTCOME INFORMATION:

1. Specify the Risk Characterization Method(s) used to achieve the RAO described above:

☐ a. Method 1 ☐ b. Method 2 ☑ c. Method 3

☐ d. Method Not Applicable-Contamination reduced to or consistent with background, or Threat of Release abated

2. Specify all Soil Category(ies) applicable. More than one Soil Category may apply at a Site. Be sure to check off all **APPLICABLE** categories:

☐ a. S-1/GW-1	☐ d. S-2/GW-1	☐ g. S-3/GW-1
☑ b. S-1/GW-2	☐ e. S-2/GW-2	☑ h. S-3/GW-2
☑ c. S-1/GW-3	☐ f. S-2/GW-3	☑ i. S-3/GW-3

3. Specify all Groundwater Category(ies) impacted. A site may impact more than one Groundwater Category. Be sure to check off all **IMPACTED** categories:

☐ a. GW-1 ☑ b. GW-2 ☑ c. GW-3 ☐ d. No Groundwater Impacted

4. Specify remediation conducted:

☑ a. Check here if soil remediation was conducted.

☐ b. Check here if groundwater remediation was conducted.

5. Specify whether the analytical data used to support the Response Action Outcome was generated pursuant to the Department's Compendium of Analytical Methods (CAM) and 310 CMR 40.1056:

☑ a. CAM used to support all analytical data. ☐ b. CAM used to support some of the analytical data.

☐ c. CAM not used.

☑ 6. Check here to certify that the Class A, B or C Response Action Outcome includes a Data Usability Assessment and Data Representativeness Evaluation pursuant to 310 CMR 40.1056.

7. Estimate the number of acres this RAO Statement applies to: 0.07

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC104

RESPONSE ACTION OUTCOME (RAO) STATEMENT

Pursuant to 310 CMR 40.1000 (Subpart J)

Release Tracking Number
3 - 23246

G. LSP SIGNATURE AND STAMP:

I attest under the pains and penalties of perjury that I have personally examined and am familiar with this transmittal form, including any and all documents accompanying this submittal. In my professional opinion and judgment based upon application of (i) the standard of care in 309 CMR 4.02(1), (ii) the applicable provisions of 309 CMR 4.02(2) and (3), and 309 CMR4.03(2), and (iii) the provisions of 309 CMR 4.03(3), to the best of my knowledge, information and belief,

> *if Section B indicates that either an* ***RAO Statement, Phase I Completion Statement and/or Periodic Review Opinion*** *is being provided,* the response action(s) that is (are) the subject of this submittal (i) has (have) been developed and implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) comply(ies) with the identified provisions of all orders, permits, and approvals identified in this submittal.

I am aware that significant penalties may result, including, but not limited to, possible fines and imprisonment, if I submit information which I know to be false, inaccurate or materially incomplete.

1. LSP #: 9719

2. First Name: ILEEN S   3. Last Name: GLADSTONE

4. Telephone: (781) 721-4012   5. Ext.:   6. FAX:

7. Signature: ILEEN S GLADSTONE

8. Date: 10/21/2011
mm/dd/yyyy

9. LSP Stamp: Commonwealth of Massachusetts Licensed Site Professional Electronic Seal

H. PERSON MAKING SUBMITTAL:

1. Check all that apply: ☐ a. change in contact name ☐ b. change of address ☑ c. change in the person undertaking response actions

2. Name of Organization: UNIFIRST CORPORATION

3. Contact First Name: TIM   4. Last Name: COSGRAVE

5. Street: 68 JONSPIN ROAD   6. Title: SENIOR MANAGER, EHS

7. City/Town: WILMINGTON   8. State: MA   9. ZIP Code: 01887-1090

10. Telephone: (978) 658-8888   11. Ext.: 4332   12. FAX:

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC104

RESPONSE ACTION OUTCOME (RAO) STATEMENT

Pursuant to 310 CMR 40.1000 (Subpart J)

Release Tracking Number 3 - 23246

I. RELATIONSHIP TO RELEASE OR THREAT OF RELEASE OF PERSON MAKING SUBMITTAL:

☑ 1. RP or PRP ☐ a. Owner ☐ b. Operator ☐ c. Generator ☐ d. Transporter

☑ e. Other RP or PRP Specify: OTHER PRPS

☐ 2. Fiduciary, Secured Lender or Municipality with Exempt Status (as defined by M.G.L. c. 21E, s. 2)

☐ 3. Agency or Public Utility on a Right of Way (as defined by M.G.L. c. 21E, s. 5(j))

☐ 4. Any Other Person Making Submittal Specify Relationship:

J. REQUIRED ATTACHMENT AND SUBMITTALS:

☐ 1. Check here if the Response Action(s) on which this opinion is based, if any, are (were) subject to any order(s), permit(s) and/or approval(s) issued by DEP or EPA. If the box is checked, you MUST attach a statement identifying the applicable provisions thereof.

☐ 2. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of the submittal of an RAO Statement that relies on the public way/rail right-of-way exemption from the requirements of an AUL.

☑ 3. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of the submittal of a RAO Statement with instructions on how to obtain a full copy of the report.

☑ 4. Check here to certify that documentation is attached specifying the location of the Site, or the location and boundaries of the Disposal Site subject to this RAO Statement. If submitting an RAO Statement for a PORTION of a Disposal Site, you must document the location and boundaries for both the portion subject to this submittal and, to the extent defined, the entire Disposal Site.

☑ 5. Check here to certify that, pursuant to 310 CMR 40.1406, notice was provided to the owner(s) of each property within the disposal site boundaries, or notice was not required because the disposal site boundaries are limited to property owned by the party conducting response actions. (check all that apply)

- ☑ a. Notice was provided prior to, or concurrent with the submittal of a Phase II Completion Statement to the Department.
- ☑ b. Notice was provided prior to, or concurrent with the submittal of this RAO Statement to the Department.
- ☐ c. Notice not required. d. Total number of property owners notified, if applicable: 112

☑ 6. Check here if required to submit one or more AULs. You must submit an AUL Transmittal Form (BWSC113) and a copy of each implemented AUL related to this RAO Statement. Specify the type of AUL(s) below: (required for Class A-3, A-4, B-2, B-3 RAO Statements)

- ☑ a. Notice of Activity and Use Limitation b. Number of Notices submitted: 1
- ☐ c. Grant of Environmental Restriction d. Number of Grants submitted:

☐ 7. If an RAO Compliance Fee is required for any of the RTNs listed on this transmittal form, check here to certify that an RAO Compliance Fee was submitted to DEP, P. O. Box 4062, Boston, MA 02211.

☐ 8. Check here if any non-updatable information provided on this form is incorrect, e.g. Site Address/Location Aid. Send corrections to the DEP Regional Office.

☑ 9. Check here to certify that the LSP Opinion containing the material facts, data, and other information is attached.

RESPONSE ACTION OUTCOME (RAO) STATEMENT

Pursuant to 310 CMR 40.1000 (Subpart J)

Release Tracking Number

3 - 23246

K. CERTIFICATION OF PERSON MAKING SUBMITTAL:

1. I, TIMOTHY COSGRAVE , attest under the pains and penalties of perjury (i) that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this transmittal form, (ii) that, based on my inquiry of those individuals immediately responsible for obtaining the information, the material information contained in this submittal is, to the best of my knowledge and belief, true, accurate and complete, and (iii) that I am fully authorized to make this attestation on behalf of the entity legally responsible for this submittal. I/the person or entity on whose behalf this submittal is made am/is aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate, or incomplete information.

2. By: TIMOTHY COSGRAVE
Signature

3. Title: SENIOR MANAGER, EHS

4. For: UNIFIRST CORPORATION
(Name of person or entity recorded in Section H)

5. Date: 10/21/2011
mm/dd/yyyy

☐ 6. Check here if the address of the person providing certification is different from address recorded in Section H.

7. Street:

8. City/Town:

9. State:

10. ZIP Code:

11. Telephone:

12. Ext.:

13. FAX:

YOU ARE SUBJECT TO AN ANNUAL COMPLIANCE ASSURANCE FEE OF UP TO $10,000 PER BILLABLE YEAR FOR THIS DISPOSAL SITE. YOU MUST LEGIBLY COMPLETE ALL RELEVANT SECTIONS OF THIS FORM OR DEP MAY RETURN THE DOCUMENT AS INCOMPLETE. IF YOU SUBMIT AN INCOMPLETE FORM, YOU MAY BE PENALIZED FOR MISSING A REQUIRED DEADLINE.

Date Stamp (DEP USE ONLY:)

Received by DEP on

10/21/2011 4:00:24 PM

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Other Email :

Form Name: BWSC104 Response Action Outcome Transmittal Form

RTN: 3-23246
Location: 50 TUFTS ST & PROP ACROSS THE ST
Address: 50 TUFTS ST, SOMERVILLE, 021454129

Person Making Submittal
UNIFIRST CORPORATION
TIM COSGRAVE
68 JONSPIN ROAD
WILMINGTON, MA 01887-1090

LSP
LSP #: 9719
LSP Name: ILEEN S GLADSTONE

Person Making Certification
UNIFIRST CORPORATION
Timothy Cosgrave

,

Ancillary Document Uploaded/Mailed
BWSC-104 Ques.B4 - RAO-P Report - Uploaded (12 Morton Class A-3 RAO-P.pdf)

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Geotechnical
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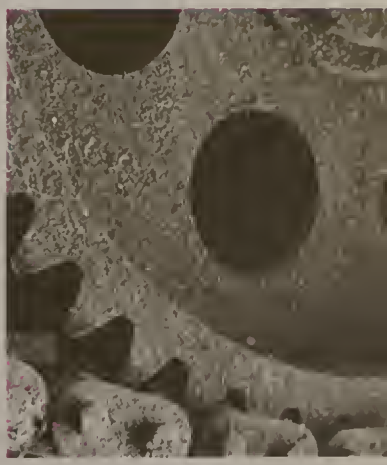

Appendix B

Public Notification Documentation

40 YEARS
1970 TO 2010

GEI Consultants

Geotechnical
Environmental
Water Resources
Ecological

October 21, 2011
Project 04516-3

Mr. Joseph A. Curtatone
Somerville City Hall
93 Highland Avenue
Somerville, MA 02143-1740

Dear Mayor Curtatone:

Re: Class A-3 Response Action Outcome Partial Statement
12 Morton Street
Somerville, Massachusetts
MassDEP RTN 3-23246

On behalf of UniFirst Corporation (UniFirst) of Wilmington, Massachusetts, GEI Consultants, Inc. is notifying your office that a Class A-3 Response Action Outcome Partial (RAO-P) Statement has been prepared for the portion of the 50 Tufts Street disposal site identified as 12 Morton Street in Somerville, Massachusetts.

The conclusions of the Class A-3 RAO-P Statement include the following:

- Remedial actions were conducted and a Permanent Solution has been achieved.
- A condition of No Significant Risk (NSR) to human health, safety, public welfare, and the environment exists for all receptors.
- An Activity and Use Limitation is required to maintain a condition of NSR.

The RAO-P has been submitted to the Massachusetts Department of Environmental Protection (MassDEP) Northeast Regional Office in Wilmington, Massachusetts for the above-reference Site. A copy of the report has been provided to Mr. Vithal V. Deshpande, Environmental Coordinator for the City of Somerville.

If you have any questions, please do not hesitate to contact me at 781-721-4012 or igladstone@geiconsultants.com.

Sincerely,

GEI CONSULTANTS, INC.

Ileen S. Gladstone, P.E., LSP, LEED AP
Vice President

JDR/ISG:csh
c: John R. Badey, UniFirst Corporation
Vithal V. Deshpande, City of Somerville
MassDEP (as part of Status Report)

1970TO2010 YEARS

GEI Consultants

Geotechnical
Environmental
Water Resources
Ecological

October 21, 2011
Project 04516-3

Ms. Paulette Renault-Caragianes
Director, Health Department
City Hall Annex
50 Evergreen Avenue
Somerville, MA 02145-2819

Dear Ms. Renault-Caragianes:

Re: Class A-3 Response Action Outcome Partial Statement
12 Morton Street
Somerville, Massachusetts
MassDEP RTN 3-23246

On behalf of UniFirst Corporation (UniFirst) of Wilmington, Massachusetts, GEI Consultants, Inc. is notifying your office that a Class A-3 Response Action Outcome Partial (RAO-P) Statement has been prepared for the portion of the 50 Tufts Street disposal site identified as 12 Morton Street in Somerville, Massachusetts.

The conclusions of the Class A-3 RAO-P Statement include the following:

- Remedial actions were conducted and a Permanent Solution has been achieved.
- A condition of No Significant Risk (NSR) to human health, safety, public welfare, and the environment exists for all receptors.
- An Activity and Use Limitation is required to maintain a condition of NSR.

The RAO-P has been submitted to the Massachusetts Department of Environmental Protection (MassDEP) Northeast Regional Office in Wilmington, Massachusetts for the above-reference Site. A copy of the report has been provided to Mr. Vithal V. Deshpande, Environmental Coordinator for the City of Somerville.

If you have any questions, please do not hesitate to contact me at 781-721-4012 or igladstone@geiconsultants.com.

Sincerely,

GEI CONSULTANTS, INC.

Ileen S. Gladstone, P.E., LSP, LEED AP
Vice President

JDR/ISG:csh
c: John R. Badey, UniFirst Corporation
Vithal V. Deshpande, City of Somerville
MassDEP (as part of Status Report)

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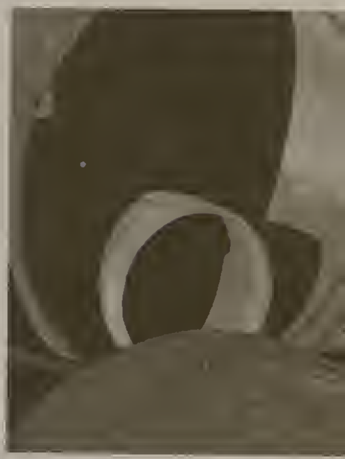

MassDEP RTN 3-23246
Class A-3 Response Action Outcome Partial Statement
for 12 Morton Street, Somerville, Massachusetts
50 Tufts Street Site, Somerville, Massachusetts
UniFirst Corporation
October 21, 2011

Appendix C

Method 3 Risk Characterization

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Risk Characterization

12 Morton Street, Somerville, MA

October 2011

ARCADIS

Risk Characterization

12 Morton Street
Somerville, Massachusetts

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Date:
October 2011

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1. INTRODUCTION

This submittal presents the results of a Method 3 Risk Characterization for current and potential exposure pathways associated with the portion of the 50 Tufts Street Site (the Site), Massachusetts Department of Environmental Protection (MassDEP) Release Tracking Number (RTN) 3-23246, located at 12 Morton Street in Somerville, Massachusetts. 12 Morton Street is a multi-family residence located approximately 150 feet east of the 50 Tufts Street property.

This Risk Characterization was prepared to support the Response Action Outcome (RAO) Partial Statement prepared by GEI and is not intended to be a stand-alone document. Potential risks associated with portions of the Site were previously assessed and presented as part of the Response to Notice of Audit Findings dated May 2009 and the Immediate Response Action (IRA) Completion Report and Remedial Monitoring Report (RMR) No. 11 dated November 2009 prepared for the Site. Potential risks associated with portions of the Site were also assessed and presented in the Updated Revised Supplemental Method 3 Risk Characterization (GEI 2011). This Risk Characterization report summarizes, where applicable, information on site characterization and Massachusetts Contingency Plan (MCP) compliance; however, additional information is contained in the RAO Statement and the prior Risk Characterization submittals (GEI 2008, GEI 2009a, GEI 2009b, GEI 2011). In addition, certain Figures referenced herein are contained in the RAO Statement to which this Risk Characterization is appended. This Risk Characterization assumes that the exposure pathway elimination measure (EPEM) at 12 Morton Street will be maintained in accordance with the AUL recorded on the property.

This Risk Characterization was conducted in accordance with 310 CMR 40.0900 of the MCP, the MassDEP's Guidance for Disposal Site Risk Characterization - In Support of the MCP (MassDEP 1995), and current risk assessment practice in Massachusetts. The purpose of this Risk Characterization was to evaluate potential risk of harm to health, safety, public welfare, and the environment at 12 Morton Street posed by compounds of potential concern (COPCs) associated with the Site. The portion of the Site to which this Risk Characterization applies is depicted in Figure 2 of the RAO Statement and described in Section 1.6.1 of the RAO Statement.

2. RISK CHARACTERIZATION APPROACH

As summarized in the May 2009, November 2009, and April 2011 Risk Characterization Reports prepared for the Site, a Method 3 approach to risk characterization was selected for the Site. As specified in the MCP (MassDEP 2008a), the Method 3 Risk Characterization approach is acceptable for any MCP Site.

The Risk Characterization of harm to human health includes four steps. In the first step, Hazard Identification, COPCs are selected for quantitative evaluation in the Risk Characterization. The second step, Dose-Response Assessment, describes the relationship between the magnitude of exposure (dose) and the potential occurrence of health effects (response) for each COPC. The third step, Exposure Assessment, identifies potential human receptors based on characteristics of the Site and quantifies the magnitude and frequency of receptors' potential exposure to COPCs. The fourth step, Risk Characterization, combines the information from the previous three steps to derive quantitative estimates of the likelihood for adverse noncarcinogenic health effects or carcinogenic effects.

Potential noncarcinogenic and carcinogenic effects were estimated for each receptor for each potential exposure pathway identified in the Exposure Assessment. The estimated potential risks from each exposure pathway were summed to obtain an estimate of total risk for each receptor. Details on the steps of the human health assessment, as well as the risk characterization of harm to safety, public welfare, and the environment, are provided in the remainder of this Report.

3. HAZARD IDENTIFICATION

The Hazard Identification step includes a discussion of the data sets considered and COPCs selected for quantitative evaluation in the Risk Characterization.

Consistent with the May 2009, November 2009, and April 2011 Risk Characterization Reports prepared for the Site, potential outdoor exposures at the 12 Morton Street property were evaluated using data collected within the "Other Streets" exposure area located within the boundaries of the Site. The boundaries of this exposure area are depicted on Figure RC-1. The "Other Streets" exposure area includes portions of the following streets located north and east of Tufts Street: Glen Street, Morton Street, Knowlton Street, Franklin Street, Franklin Avenue, Palmer Avenue, Hadley Court, Cobble Hill Road, New Washington Street, and Washington Street. The Capuano Center (located at 150 Glen Street) and samples collected within streets adjacent to these defined properties were also included in this exposure area.

3.1 Data Sets

Consistent with prior Risk Characterizations, the results from soil, groundwater, soil vapor, and outdoor air samples collected within the "Other Streets" exposure area were used to estimate potential risks for receptors at 12 Morton Street. The "Other Streets" data sets were presented in Tables 11-1e, 11-2e, 11-3e, and 11-4 of the July 2008 Phase II Comprehensive Site Assessment (CSA), Method 3 Risk Characterization, and Phase III Remedial Action Plan (RAP). For purposes of this report, only a subset of the full "Other Streets" soil, groundwater, and soil vapor datasets are re-presented in Tables RC-1, RC-2, and RC-3. These tables present only those sample locations from which one or more exposure point concentrations (EPCs) were selected (maximum detects or maximum temporal averages of one or more COPCs). As further discussed in Section 5 of this Report, soil, groundwater, and soil vapor EPCs used to assess potential exposures to receptors at 12 Morton Street are a conservative representation of actual concentrations at 12 Morton Street. Tables RC-4 and RC-5 present outdoor air and indoor air data, respectively, from which EPCs were calculated. The soil, groundwater, soil vapor, outdoor air, and indoor air data sets considered in this Risk Characterization are briefly discussed in the following paragraphs.

The soil data set selected for this Risk Characterization consists of the maximum soil concentrations within the “Other Streets” exposure area collected from April 2006 through March 2008 (Table RC-1). Soil samples have been collected within the exposure area subsequent to March 2008. However, a review of the soil data collected subsequent to March 2008 indicates detectable concentrations of COPCs that are consistent with or less than concentrations in soil considered in prior Risk Characterizations. Therefore, risk estimates presented in the prior Risk Characterizations are a conservative representation of current exposures to soil at 12 Morton Street.

Groundwater samples have been collected from 19 monitoring wells within the “Other Streets” exposure area. The groundwater data set selected for this Risk Characterization consists of the maximum temporal groundwater concentrations within the “Other Streets” exposure area (Table RC-2). Consistent with prior Risk Characterizations, all groundwater data used in this assessment were collected from January 2007 through April 2008. A review of groundwater data collected subsequent to April 2008 indicates detectable concentrations of COPCs that are consistent with or less than concentrations in groundwater considered in the July 2008 Risk Characterization. Therefore, risk estimates presented in the July 2008 Risk Characterization are a conservative representation of current exposures to groundwater. Because the depth to groundwater ranges from 5 to 15 feet below ground surface (ft bgs), potential human exposure to groundwater is limited to the potential inhalation of volatile COPCs during hypothesized future construction activities.

Soil vapor samples used in this Risk Characterization were collected within the “Other Streets” exposure area from January 2007 through April 2008 (Table RC-3). During this period, soil vapor samples were collected from 10 locations within the “Other Streets” exposure area during several rounds of investigation. The soil vapor data set used in this Risk Characterization consists of the maximum temporal soil gas concentrations within the “Other Streets” exposure area (Table RC-3). Potential exposures of construction workers were estimated using soil vapor data collected from monitoring wells equipped with a soil vapor sampling port and valve.

Outdoor air data used in this Risk Characterization were collected by GEI in 2006, 2007, and 2008 from locations within the “Other Streets” exposure area (Table RC-4). These samples were used to estimate potential exposures to outdoor air at 12 Morton Street.

GEI collected one sub-slab soil vapor sample from beneath 12 Morton Street in May 2007. Tetrachloroethylene (PCE) was detected at 1,010 µg/m^3. Based on this result, a potential vapor intrusion pathway was identified at 12 Morton Street, and an EPEM was recommended. Installation of an early variation of an Option 2 EPEM was completed in March 2008. GEI collected post-EPEM indoor air samples from the first floor and basement on March 5 and March 21, 2008 and April 3, 2009. PCE was not detected above laboratory reporting limits in these samples. GEI collected additional 24-hour indoor air samples from the first floor and basement on March 9 and November 19, 2010. PCE was detected in the basement at the laboratory reporting limit of 1.4 $\mu g/m^3$ on March 9, 2010 but was not detected above the laboratory reporting limit in other samples.

Prior Risk Characterizations prepared for the Site did not quantitatively evaluate the indoor air pathway at 12 Morton Street because it was assumed that the vapor migration pathway was not complete (based on non-detect post-EPEM indoor air sampling results). Due to a slight detection of PCE within the March 2010 basement air sample, the indoor air pathway was included in this Risk Characterization. Specifically, results from the five post-EPEM indoor air sampling events were used to estimate potential risks to receptors at 12 Morton Street. As described in Section 5.6, the temporal averages of spatially averaged indoor air concentrations at 12 Morton Street were selected as the indoor air EPCs. Table RC-5 presents data only for COPCs detected at least once in indoor air. This Risk Characterization assumes the EPEM will be maintained in accordance with the AUL recorded on the property.

3.2 Selection of COPCs

The following 11 COPCs were selected for quantitative evaluation in this Risk Characterization and are consistent with the COPCs selected for the Site-wide Risk Characterizations previously prepared for the Site: vinyl chloride, trichloroethylene (TCE), 1,1,1-trichloroethane (TCA), trans-1,2-dichloroethylene, PCE, 1,1-dichloroethylene, cis-1,2-dichloroethylene, 1,1-dichloroethane, chloroform, chloroethane, and carbon tetrachloride.

Analytical results for certain COPCs detected in indoor and outdoor air samples were questionable, based on a review of groundwater sample results and a determination of whether the compound is a breakdown product of the chlorinated solvents detected in samples collected at 50 Tufts Street. A review indicated that detected concentrations of chloroform, chloroethane, and carbon tetrachloride in indoor air and outdoor air are not associated with the Site. As a result, these compounds were not considered COPCs in indoor air or outdoor air. The rationale for this determination is described below for each relevant compound:

- Chloroform – Chloroform was detected at low concentrations in groundwater, well below MassDEP's Method 1 GW-2 Standard (50 µg/L), which is protective of residential exposure to indoor air. Therefore, it would not contribute significantly to potential indoor air exposures. Chloroform is commonly present in environmental samples as a result of laboratory sample processing and is not a degradation product of chlorinated solvents.

- Chloroethane – Chloroethane was only detected in one monitoring well beyond 50 Tufts Street. The well (MW-116) was located approximately 400 feet downgradient from the 50 Tufts Street boundary at levels slightly above the laboratory reporting limit (2.3 and 2.4 µg/L) and therefore does not pose a risk of impacting indoor air quality.

- Carbon Tetrachloride – Carbon tetrachloride was not detected in soil or groundwater samples collected outside the boundaries of the 50 Tufts Street property. In addition, carbon tetrachloride was above the laboratory reporting limit in only one indoor air sample collected at a location outside the boundaries of 50 Tufts Street. Further, carbon tetrachloride was detected in all outdoor air samples at similar values because of its ubiquitous nature in ambient air.

4. DOSE-RESPONSE ASSESSMENT

The purpose of the Dose-Response Assessment is to identify the relationship between the magnitude of COPCs to which receptors may be exposed (dose) and the likelihood of an adverse health effect (response). Both noncarcinogenic (i.e., threshold) and carcinogenic (i.e., non-threshold) health effects were considered in this Risk Characterization. Dose-response information used in this Risk Characterization was obtained from MassDEP publications (MassDEP 2008b), including a document entitled "Revised Proposed Interim Unit Risk Revision for Tetrachloroethylene" (MassDEP 2008c). Toxicity values for chloroethane were not available from MassDEP Publications. Therefore, toxicity values for chloroethane were obtained from the U.S. Environmental Protection Agency's (U.S. EPA) Integrated Risk Information System (IRIS; U.S. EPA 2008). The toxicity data used in this Risk Characterization are shown in Table RC-6. Additional information regarding noncarcinogenic and carcinogenic dose-response assessment was provided in prior Risk Characterizations prepared for the Site.

5. EXPOSURE ASSESSMENT

5.1 Receptors and Exposure Pathways

Consistent with the requirements of the MCP (310 CMR 40.0923), the exposure assessment considered both current and reasonably foreseeable future activities and uses at 12 Morton Street. The current use of 12 Morton Street is as a residence, and the reasonably conservative foreseeable use of the property is also residential. The potentially complete exposure pathways for residents include incidental ingestion and dermal contact with accessible surficial soil (0 to 3 ft bgs), inhalation of soil derived particulates and volatiles in ambient air, and inhalation of volatiles in indoor air. Groundwater is not currently used (and is not expected to be used in the future) as a potable water source. Groundwater meets none of the definitions of a Current or Potential Drinking Water Source Area and as such is not categorized as GW-1.

As discussed in Section 3.1 above, PCE was reported at the laboratory reporting limit in one of five post-mitigation indoor air samples at 12 Morton Street. Therefore, the indoor air pathway is considered and evaluated as complete for current and future residents in this Risk Characterization.

Two different residential receptors were considered in this Risk Characterization: a "homebound resident" exposed to the indoor air pathway only and a "resident" exposed via both indoor and outdoor exposure pathways. A homebound resident is assumed to be exposed 365 days per year for 24 hours per day, while the exposure duration value used to evaluate the non-homebound resident receptor considers the following indoor exposure durations for each lifestage:

- Infant: 24 hours per day indoors for 365 days per year;
- Young Child and Older Child: 20 hours per day indoors during summer months and 24 hours per day indoors during winter months; and
- Adult: 16 hours per day indoors during summer months and 24 hours per day indoors during winter months.

Exposure assumptions are further described in Section 5.7 of this report.

Future use receptors of the 12 Morton Street property consist of future residents and construction workers during potential future excavation/development activities. Complete exposure pathways for these receptors are summarized below:

- The potentially complete future exposure pathways for residents include incidental ingestion and dermal contact with soil (0 to 15 ft bgs) that may have been relocated to the surface during property development activities, inhalation of soil derived particulates and volatile compounds in ambient air, and inhalation of volatiles in indoor air. It is assumed that the EPEM will continue to be maintained in accordance with the AUL recorded for the property.
- The potentially complete exposure pathways for the construction worker receptor include incidental ingestion and dermal contact with soil located between 0 and 15 ft bgs, inhalation of particulates in ambient air, and the inhalation of volatile compounds from soil, soil vapor, and/or groundwater. It was assumed that dewatering will occur prior to future construction activities and that direct contact with groundwater will be minimal. Therefore, a construction worker's incidental ingestion and dermal contact with groundwater were not quantitatively assessed in this Risk Characterization.

As noted above, this Risk Characterization assumed that the EPEM at 12 Morton Street will be maintained in accordance with the AUL. The AUL provides that a condition of No Significant Risk to health, safety, public welfare, or the environment exists for any foreseeable period of time (pursuant to 310 CMR 40.0000) so long as any of the following activities and uses occur on the Property:

- Any use of the existing building located on the Property, including use of the building as a residence, so long as the vapor barrier and venting system comprising the Exposure Pathway Elimination Measure ("EPEM") are maintained and, if an electric fan is added to the EPEM, such fan operates continuously;

- Activities and uses which are not identified by this Notice as being inconsistent with maintaining a condition of No Significant Risk;

- Such other activities or uses which, in the Opinion of an LSP, shall present no greater risk of harm to health, safety, public welfare, or the environment than the activities and uses set forth in this Paragraph; and

- Such other activities and uses not identified as being Activities and Uses Inconsistent with the AUL.

The following activities and uses are inconsistent with the objectives of the AUL and, if implemented at the Property, may result in a significant risk of harm to health, safety, public welfare, or the environment or in a substantial hazard:

- In the basement, removal or damage of the concrete floor, the overlying elastomeric coating, the vapor barrier, the sub-slab venting system, and/or the protective stucco wall finish;

- In the basement, any activities which may damage and/or compromise the concrete floor, the overlying elastomeric coating, the vapor barrier, the sub-slab venting system, and/or the protective stucco wall finish;

- In the event an electric fan is added to the EPEM, removal or damage of such fan;

- In the event an electric fan is added to the EPEM, shutting down, turning off, or removing electrical power to the fan, or any other activity that would make such fan inoperable;

- Any activities which may damage and/or compromise the ventilation piping located on the exterior of the building; and

- Construction of any occupied structure at the Property without the installation of an EPEM and subsequent indoor air sampling to confirm its effectiveness in preventing or mitigating vapor intrusion into the structure.

5.2 Soil and Groundwater Categorization

For this Risk Characterization, soil categories were identified for current and future conditions at 12 Morton Street. Residents currently present at 12 Morton Street are considered to have high frequency with high intensity contact with soil located outside of the building footprint. Exposure to soil beneath the building is considered to be isolated. Based on potential exposures for the highest exposed receptor (resident), soil currently located from 0-15 ft bgs outside of the building footprint is categorized as S-1, and soil located beneath the building footprint is categorized as S-3.

Groundwater underlying 12 Morton Street meets none of the definitions of a Current or Potential Drinking Water Source Area and as such is not categorized as GW-1. Groundwater at 12 Morton Street containing COPCs that is within 30 feet of occupied buildings and less than 15 feet below grade meets the criteria for categorization as GW-2 as defined by 310 CMR 40.0933 (MassDEP 2008a). Groundwater is categorized as GW-3 because, as provided in 310 CMR 40.0932, all groundwater of the Commonwealth is assumed to discharge to surface water and thus is categorized as GW-3.

5.3 Exposure Points

It was assumed that the current receptors at 12 Morton Street would be exposed to COPCs present in accessible surface soil (unpaved and located 0 to 3 ft bgs), outdoor air, and indoor air. Future receptors (residents and construction workers) may be exposed to COPCs detected in soil located 0 to 15 ft bgs. It was assumed that future residents would be exposed to COPCs in outdoor air and indoor air. Soil vapor data were used to estimate ambient air concentrations within future construction excavations.

5.4 "Hotspot" Evaluation

The MCP generally requires evaluation of exposures, as well as Upper Concentration Limit (UCL) comparisons, in "hotspots". The MCP (310 CMR 40.0006) defines a "hotspot" as an area where concentrations are more than 100-fold higher than the surrounding areas, except where the potential for greater exposure exists. For the soil data "hotspot" reviews, the highest detected concentrations were compared to surrounding concentrations, while for the groundwater and soil vapor data "hotspot" reviews, the highest temporally averaged concentrations were compared to temporally averaged surrounding concentrations. In no case was a maximum concentration surrounded by concentrations more than 100-fold lower than the maximum. Although concentrations more than 10-fold higher than surrounding concentrations were identified during this evaluation, no specific point or sub-area represents a location with higher potential for exposure than elsewhere. Therefore, no "hotspots" are present.

5.5 Qualitative Evaluation of Potential Exposures

Quantitative evaluations based on hypothetical receptors with the greatest potential for exposure at 12 Morton Street result in conservative estimates for receptors with less intrusive roles at the property. Specifically, landscapers, trespassers, and visitors would have lower frequencies of exposure than a resident. Using this rationale, landscapers, trespassers, and visitors were evaluated qualitatively via comparison to quantified exposures for the residential receptor. If "No Significant Risk" was demonstrated for the more highly exposed receptor, it was indicative of "No Significant Risk" to less exposed receptors.

5.6 Estimation of Exposure Point Concentrations

An EPC is defined as the chemical concentration in a given medium that a potential receptor may encounter at an exposure area. The EPCs used to evaluate potential exposures at the 12 Morton Street property are consistent with the EPCs selected for the "Other Streets" exposure area presented in the prior Site-wide Risk Characterizations. A summary of soil, groundwater, soil vapor, outdoor air, and indoor air EPCs used in this Risk Characterization is presented in Table RC-7. EPCs were calculated as described below. If a COPC was not detected, then one-half the lowest laboratory reporting limit was assumed.

- The maximum detected soil concentration within the "Other Streets" exposure area was conservatively designated as the soil EPC for each COPC. These area-wide soil EPCs are considered to be conservative for potential 12 Morton Street exposures since chlorinated VOCs were not detected in soils collected beneath the building foundation during installation of the EPEM in January 2008 (See Table 4 of the RAO).
- Groundwater EPCs were developed for each exposure area where potential exposure may exist. To adequately represent seasonal influences on groundwater concentrations, the arithmetic mean of COPC concentrations detected was calculated for each monitoring well in the "Other Streets" exposure area using recent rounds of groundwater samples (2006 to 2008), and the maximum calculated average was used as the EPC for the future construction scenario.
- The arithmetic mean of the last four soil vapor sampling rounds (2007 to 2008) was calculated within each soil vapor sampling point, and the maximum calculated average was the soil vapor EPC for each COPC for the future construction scenarios. The arithmetic mean of the measured concentrations was calculated assuming that non-detected compounds were present at one-half the laboratory reporting limit. If a COPC was not detected in a given exposure area, then one-half the lowest laboratory reporting limit was used as the EPC for that COPC.
- The arithmetic mean of measured concentrations in outdoor air was used to represent the outdoor air EPC for each COPC for the identified receptors.
- To evaluate potential exposures to constituents that may volatilize from soil, soil vapor, and/or groundwater into the ambient air of an excavation, EPCs for excavation ambient air were estimated

for use in the construction scenarios. The concentrations for ambient air within an excavation were predicted from each of the above-defined EPCs for soil, groundwater, and soil vapor. The average of the three predicted ambient air values was then retained as the EPC for ambient air for the construction worker scenario. Refer to prior Risk Characterization Reports completed for the Site for a summary of the vapor transport model used to estimate the ambient air EPCs.

- Data for COPCs detected at least once in indoor air were processed in the following manner. First, any field duplicate samples collected from the first floor or basement were averaged using one-half the laboratory reporting limit for non-detects. Next, results from each sampling event were combined as a spatially weighted average assuming that a resident spends four hours per day in the basement and the remaining 20 hours per day on the first floor. This assumption is based on GEI site visits that have confirmed that the basement at 12 Morton Street has less than 7 feet of headroom, is currently used for storage only, and is unlikely to be converted to living space in the foreseeable future. Lastly, results were averaged across the five sampling events. This temporal average was selected as the indoor air EPC. COPCs that were not detected above their respective laboratory reporting limits within 12 Morton Street were assumed to be present at one-half those reporting limits.

5.7 Quantification of Potential Exposures

The equations and assumptions used to evaluate potential exposures at 12 Morton Street are presented in Appendix A to this Report. These equations are consistent with equations presented by MassDEP (1995) and risk assessment guidance issued by the U.S. EPA (1989). Refer to the prior Site-wide Risk Characterization reports prepared for the Site for a detailed discussion of the equations and assumptions. The spreadsheets used to calculate average daily dose and exposure (ADD and ADE) and the lifetime average daily dose and exposure (LADD and LADE) are contained in Appendix A to this Report.

Relative Absorption Factors (RAFs) used in this Risk Characterization are shown in Table RC-8. The RAFs were obtained from MassDEP (2008b). For COPCs that were not listed in MassDEP (2008b), ARCADIS has derived RAFs using standard approaches as used by MassDEP (2008b).

Measured or calculated values for physical and chemical properties used in this Risk Characterization for each COPC are shown in Table RC-9. These values were used to model volatilization of COPCs from soil or groundwater to air in a hypothetical future construction excavation. Exposure assumptions for each exposure scenario are presented in Appendix A.

6. RISK CHARACTERIZATION

Risk characterization includes estimates of the potential human health risks from exposure to noncarcinogens. It also includes an assessment of the potential excess cancer risk from exposure to known and possible carcinogens.

Estimated total noncarcinogenic and carcinogenic risks for the evaluated exposure pathways and receptors at 12 Morton Street are presented in Table RC-10. The results of the Risk Characterization demonstrate that the cancer and non-cancer risks associated with the evaluated exposure scenarios are within the MassDEP acceptable limits. Estimates of outdoor risks are consistent with potential outdoor risks presented in prior Risk Characterization reports for receptors in the “Other Streets” exposure area. Estimates of risks from indoor air to the receptor with greatest exposure, the homebound resident, are within MassDEP acceptable limits, as are estimates of cumulative risks from all evaluated indoor and outdoor pathways to current and future residents at 12 Morton Street. The risk calculations, which provide results for each receptor, exposure pathway, and COPC, are contained in Appendix A to this Report.

In accordance with 310 CMR 40.0994, the risk of harm to safety and public welfare was evaluated. No overt situations posing a threat of physical harm or bodily injury exist, nor have persistent odors associated with the release been reported following Immediate Response Action (IRA) activities. As such, conditions at the Site do not pose a threat of physical harm or bodily injury, and present no dangerous or nuisance conditions. As part of the public welfare evaluation, soil and groundwater EPCs were compared to MassDEP’s UCLs. Groundwater and soil EPCs are below the UCLs in all cases.

Risk to the Environment was evaluated in this Risk Characterization in accordance with MassDEP guidance and regulations (Method 3 Environmental Risk Characterization (MassDEP 1996) and 310 CMR 40.0000 (MassDEP 2008a)). Based on the terrestrial and aquatic habitat evaluation, no "potentially significant exposures" to identified environmental receptors from COPCs likely exist, and a Stage II Environmental Risk Characterization is not necessary. Accordingly, conditions at the Site pose “No Significant Risk” to the Environment.

7. UNCERTAINTY ANALYSIS

Within any of the four steps of the risk assessment process, assumptions must be made due to a lack of absolute scientific knowledge. Some of the assumptions are supported by considerable scientific evidence, while others have less support. Every assumption introduces some degree of uncertainty into the risk assessment process. Conservative assumptions are made throughout the risk assessment to ensure that the health of local residents and the environment are protected. Therefore, when all of the assumptions are combined, it is much more likely that actual risks, if any, are over-estimated rather than under-estimated. Refer to the prior Risk Characterizations prepared for the Site for a summary of the assumptions that introduce the greatest amount of uncertainty in this Risk Characterization.

8. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Currently available data from Site assessment activities, as well as information from other sources (e.g., MassDEP and U.S. EPA guidance documents), were used to conduct the Risk Characterization for 12 Morton Street in Somerville, Massachusetts. This property is located within the boundaries of the 50 Tufts Street Site (RTN 3-23246). The Risk Characterization evaluated potential risk to current and future receptors assumed to be exposed to constituents detected in soil, soil vapor, groundwater, outdoor air, and indoor air. It is assumed that the EPEM will be maintained in accordance with the AUL recorded for the property. The results of the Risk Characterization demonstrate that the cancer and non-cancer risks associated with the evaluated exposure scenarios are within the MassDEP acceptable limits. A condition of "No Significant Risk" to human health exists at 12 Morton Street for current and potential future exposures.

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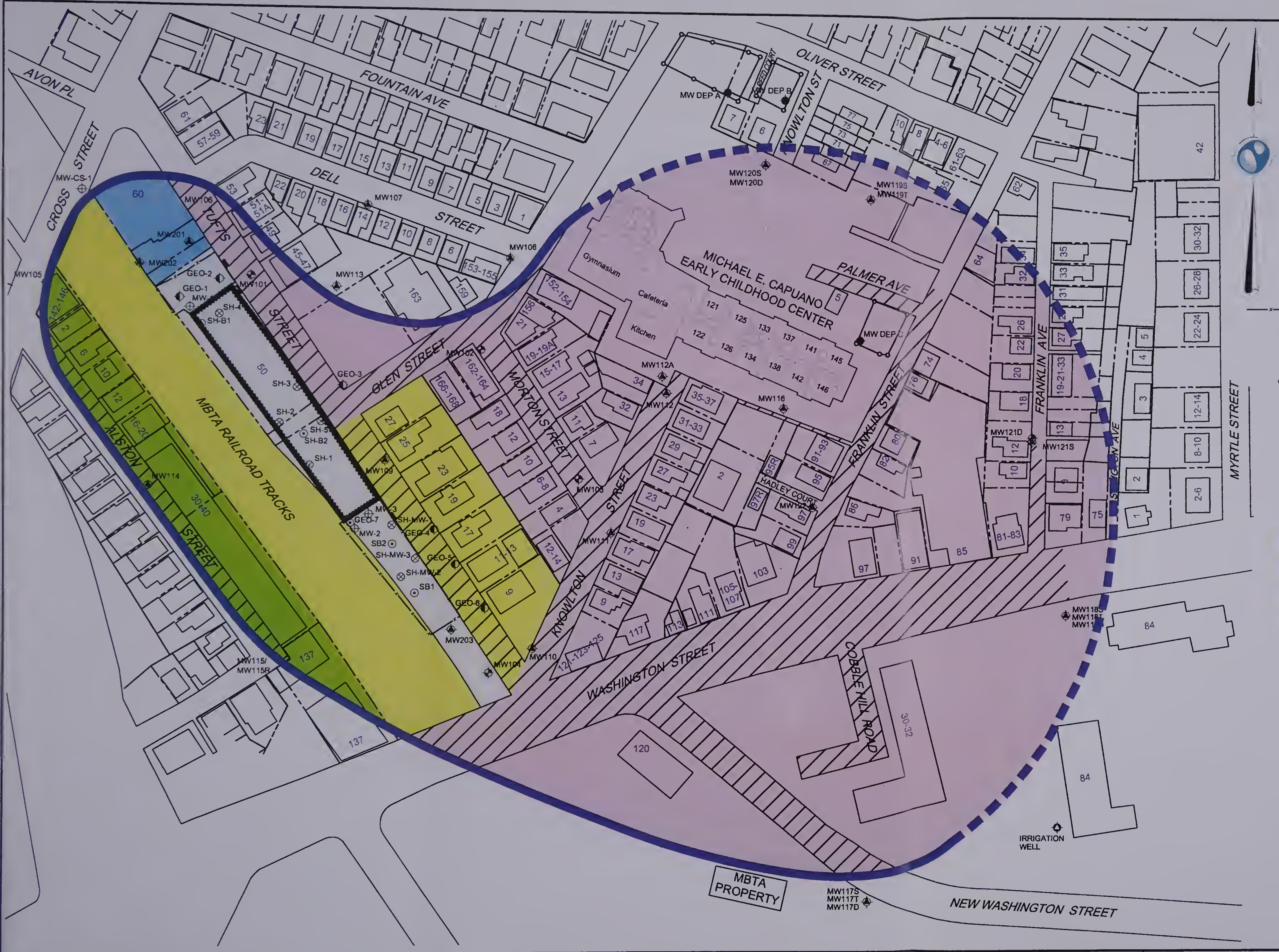


LEGEND:

◈	MONITORING WELL WITH SOIL VAPOR SAMPLE PORT INSTALLED BY GEI, JANUARY 2007 - JANUARY 2008
⊗	MONITORING WELL INSTALLED BY SANBORN HEAD ASSOCIATES, 2002
◐	MONITORING WELL INSTALLED BY GEOINSIGHT, JUNE 2004
⊙	SOIL BORING ADVANCED BY GEOINSIGHT, AUGUST 2004
◈	MONITORING WELL INSTALLED BY GEI, MAY 2006
●	DRIVEN POINT MONITORING WELL INSTALLED BY MADEP, MAY 2007
⊕	MONITORING WELL INSTALLED PREVIOUSLY, DATE UNKNOWN
◇	PREVIOUSLY INSTALLED IRRIGATION WELL
—x—x—	CHAIN LINK FENCE
138	ROOM NUMBER AT CAPUANO SCHOOL
▱	BOUNDARY OF COMMUNITY GARDENS
84	STREET ADDRESS
	MBTA = MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
━	DISPOSAL SITE BOUNDARY (DASHED WHERE INFERRED)
▨	NEIGHBORHOOD STREETS EXPOSURE AREA
☐	THE PROPERTY EXPOSURE AREA
🟩	ALSTON STREET EXPOSURE AREA
🟨	TUFTS STREET AREA AND RAILROAD EXPOSURE AREA
🟦	60 TUFTS STREET EXPOSURE AREA
🟪	OTHER STREETS EXPOSURE AREA

NOTE: BASE PLAN COMPILED FROM PHASE II COMPREHENSIVE SITE ASSESSMENT BY GEI CONSULTANTS TITLED "DISPOSAL SITE MAP AND SITE BOUNDARY," FIG. 1-2.

0' 50' 100' 150' 200'

1" = 150'

CLIENT LOGO	CLIENT: UNIFIRST CORPORATION WILMINGTON, MASSACHUSETTS	DRAWN BY: R. BOWMAN	PROJECT 50 TUFTS STREET SOMERVILLE, MASSACHUSETTS	DATE: 19 MAY 2009	
		CHECKED BY: D. PFEIFFER		PROJECT NO: 7-6540-0000	
		DATUM: NAD 83	TITLE EXPOSURE AREAS	REV. NO.: A	
		PROJECTION: N/A		FIGURE No. RC-1	
		SCALE: AS SHOWN			

Table RC-1
Risk Characterization Data - Soil
12 Morton Street
Somerville, Massachusetts

		Location Name:	MW101	95R Franklin Street		
		Sample Name:	MW101S1	95RFRANK-EASTFILL	95FRANK-SOUTH FILL	95RSUBSOIL
		Sample Depth (ft):	2 to 3	0 to 0.5	0 to 0.5	0 to 1
		Sample Date:	4/27/2006	12/14/2007	12/11/2007	12/5/2007
Analyte	**Method**	**Units**				
Volatile Organic Compounds (VOCs)						
Carbon tetrachloride	8260	mg/kg	< 0.13	< 0.2	< 0.26	< 0.21
Chloroethane			< 0.33	< 0.51	< 0.65	< 0.53
Chloroform			< 0.13	< 0.2	< 0.26	< 0.21
Dichloroethane,1,1-			< 0.13	0.43	< 0.26	0.107 J
Dichloroethylene, cis-1,2-			< 0.13	0.0969 J	0.674	0.772
Dichloroethylene,1,1-			< 0.13	0.106 J	0.491	0.184 J
Tetrachloroethylene (PCE)			0.989	46.2	58.9	42.1
Trans-1,2-Dichloroethylene			< 0.13	< 0.2	< 0.26	< 0.21
Trichloroethane,1,1,1- (TCA)			0.0767 J	0.0476 J	< 0.26	0.0604 J
Trichloroethylene (TCE)			0.358	2.16	6.17	3.31
Vinyl chloride			< 0.13	< 0.2	< 0.26	< 0.21

General Notes:

1. Only analytes used in the risk characterization are reported here.
2. "<" = The analyte was not detected at a concentration above the specified reporting limit.
3. mg/kg = milligrams per kilogram.
4. NT = not tested.
5. FD = field duplicate sample.

Qualifying Notes:

J The reported result is below the laboratory reporting limit and is estimated.

F+ The result has a high bias due to matix spike recovery above upper control limits.

Table RC-2
Risk Characterization Data - Groundwater
12 Morton Street
Somerville, Massachusetts

Sample Location:			MW101			MW111						MW116								
Well Screen Interval (ft bgs):			9 to 19	9 to 19	9 to 19	4 to 14	4 to 14	4 to 14	4 to 14	4 to 14	4 to 14	5 to 15	5 to 15	5 to 15	5 to 15	5 to 15	5 to 15	5 to 15	5 to 15	5 to 15
Sample Date:			1/17/2007	4/13/2007	4/13/2007 (FD)	1/18/2007	4/16/2007	7/18/2007	10/10/2007	1/10/2008	4/17/08	3/23/2007	4/16/2007	7/18/2007	7/18/2007	10/12/2007	10/12/2007	1/11/2008	4/15/08	4/15/08 (FD)
Collected By:			GEI	GEI	GEI	GEI	GEI	GEI	GEI	GEI	GEI	GEI	GEI	GEI	GEI	GEI	GEI	GEI	GEI	GEI
Analyte	**Method**	**Units**																		
Volatile Organic Compounds (VOCs)																				
Carbon tetrachloride	8260	µg/l	< 1.0	< 1.0	< 1.0	< 10	< 25	< 1.0	< 50	< 1.0	< 2.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0	< 2.0	< 1.0	< 1.0	< 1.0
Chloroethane			< 2.0	< 2.0	< 2.0	< 20	< 50	< 2.0	< 100	< 2.0	< 4.0	< 2.0	< 2.0	2.4	2.3	2.4 J	2.4 J	< 2.0	< 2.0	< 2.0
Chloroform			< 1.0	< 1.0	1.8	< 10	< 25	NT	< 50	1.2	< 2.0	< 1.0	< 1.0	NT	NT	< 2.0	< 2.0	< 1.0	< 1.0	< 1.0
Dichloroethane,1,1-			< 1.0	< 1.0	1.6	30.9	15.7 J	16.8	19.1 J	5.6	4.3 C+	135	4.4	97.3	96.9	80.1	79.3	18.9	66.8	64.5
Dichloroethylene, cis-1,2-			1.3	< 1.0	2.1 G	22.6	17.2 J	56.3	63.9	10.6	4.4 C+	103	21.7	415	431	346	341	49.5	105	102
Dichloroethylene,1,1-			14.1	< 1.0	4.6 G	17.6	< 25	10.5	< 50	4.1	3.7 C+	107	2.7	33.8	34	24.8	22.4	14.7	46.3	45.7
Tetrachloroethylene (PCE)			192	94	90.7	13700 F-	7370	6340	8350	3100	1160 C+	1180	32.2	167	168	116	110	267	603	607
Trans-1,2-Dichloroethylene			< 1.0	< 1.0	< 1.0	< 10	< 25	1.5	< 50	< 1.0	< 2.0	1.8	< 1.0	4.3	4.4	2.5	2.4	0.88 J	< 1.0	< 1.0
Trichloroethane,1,1,1- (TCA)			131	50.5 J+	43.0 J+	142	56.5	89.1	84.1	41.3	17.6 C+	21.6	0.67 J	10.6	10.7	9.4	9.2	3.3	10.7	10.7
Trichloroethylene (TCE)			38.4	47.2	45.7	150	84.4	120	125	42.1	19.9 C+	358	19.4	72.7	73.2	136	129	66.3	175	174
Vinyl chloride			< 1.0	< 1.0	< 1.0	< 10	< 25	< 1.0	< 50	< 1.0	< 2.0	14.1	3.2	185	182	84.9	76.4	3.1	2.6	2.7

General Notes:
1. Only analytes used in the risk characterization are reported here.
2. "< " = The analyte was not detected at a concentration above the specified reporting limit.
3. ft bgs = feet below ground surface.
4. µg/l = micrograms per liter.
5. FD = field duplicate sample.
6. NT = not tested.

Qualifying Notes:

F+ The result has a high bias due to matrix spike recovery above upper control limits.

F- The result has a low bias due to matrix spike recovery below lower control limits.

G The result is estimated due to duplicate precision outside control limits.

J The reported result is below the laboratory reporting limit and is estimated.

J+ The reported result is estimated.

Table RC-3
Risk Characterization Data - Soil Vapor
12 Morton Street
Somerville, Massachusetts

	Location:	MW111											
	Sample ID:	**MW111**		**MW111**		**SG-MW111**		**MW111-SG**		**MW111-SG**		**MW111-S9**	
	Sample Date:	**1/17/2007**		**4/11/2007**		**7/17/2007**		**10/9/2007**		**1/7/2008**		**4/14/2008**	
	Units:	**$\mu g/m^3$**	**ppbv**	**$\mu g/m^3$**	**ppbv**	**$\mu g/m^3$**	**ppbv**	**$\mu g/m^3$**	**ppbv**	**$\mu g/m^3$**	**ppbv**	**$\mu g/m^3$**	**ppbv**
Analyte	**Method**												
Volatile Organic Compounds (VOCs)	TO-15												
Carbon tetrachloride		< 1300	< 200	< 130	< 20	< 1300	< 200	< 7500	< 1200	< 130	< 20	< 25	< 4.0
Chloroethane		< 530	< 200	< 53	< 20	< 530	< 200	< 3200	< 1200	< 53	< 20	< 11	< 4.0
Chloroform		NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Dichloroethane,1,1-		943	233	67.2 J	16.6 J	< 810	< 200	< 4900	< 1200	< 81	< 20	28	6.8
Dichloroethylene, cis-1,2-		< 790	< 200	46.4 J	11.7 J	< 790	< 200	< 4800	< 1200	35 J	8.8 J	16	4.1
Dichloroethylene,1,1-		619 J	156 J	< 79	< 20	< 790	< 200	< 4800	< 1200	< 79	< 20	< 16	< 4.0
Tetrachloroethylene (PCE)		269000	39700	52600	7760	178000 G	26200 G	1360000	200000	83400	12300	49600	7310
Trans-1,2-Dichloroethylene		< 790	< 200	< 79	< 20	< 790	< 200	< 4800	< 1200	< 79	< 20	< 16	< 4.0
Trichloroethane,1,1,1- (TCA)		4650	853	715	131	2770	507	12800	2350	519	95.1	497	91.1
Trichloroethylene (TCE)		2600	484	466	86.7	1520	282	5590 J	1040 J	286	53.2	250	46.6
Vinyl chloride		< 510	< 200	< 51	< 20	< 510	< 200	< 3100	< 1200	< 51	< 20	< 10	< 4.0

General Notes:

1. Analytes detected in at least one sample are reported here. For a complete list of analytes see the attached laboratory data sheets.
2. $\mu g/m^3$ = micrograms per cubic meter.
3. ppbv = parts per billion by volume.
4. "<" = The analyte was not detected at a concentration above the specified laboratory reporting limit.

Qualifying Notes:

G The result is estimated due to duplicate precision outside control limits.

J The reported result is below the laboratory reporting limit and the result is estimated.

Table RC-3
Risk Characterization Data - Soil Vapor
12 Morton Street
Somerville, Massachusetts

	Location:	MW112													
	Sample ID:	MW112		MW112A		MW112A		SG-MW112A		MW112A-SG		MW112A-SG		MW112A-SG	
	Sample Date:	1/17/2007		3/20/2007		4/11/2007		7/17/2007		10/9/2007		1/7/2008		4/14/2008	
	Units:	$\mu g/m^3$	ppbv	$\mu g/m^3$	ppbv	$\mu g/m^3$	ppbv	$\mu g/m^3$	ppbv	$\mu g/m^3$	ppbv	$\mu g/m^3$	ppbv	$\mu g/m^3$	ppbv
Analyte	**Method**														
Volatile Organic Compounds (VOCs)	TO-15														
Carbon tetrachloride		0.69 J	0.11 J	< 63	< 10	< 130	< 20	< 13	< 2.0	< 25	< 4.0	< 25	< 4.0	< 25	< 4.0
Chloroethane		< 0.53	< 0.20	< 26	< 10	< 53	< 20	< 5.3	< 2.0	< 11	< 4.0	< 11	< 4.0	< 11	< 4.0
Chloroform		NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Dichloroethane,1,1-		< 0.81	< 0.20	429	106	155	38.2	359 G	88.6 G	1150	284	2280	564	449	111
Dichloroethylene, cis-1,2-		< 0.79	< 0.20	< 40	< 10	< 79	< 20	< 7.9	< 2.0	40.8	10.3	360	90.9	38	9.6
Dichloroethylene,1,1-		< 0.79	< 0.20	821	207	318	80.3	777 G	196 G	2080	524	3400	857	476	120
Tetrachloroethylene (PCE)		2.8	0.41	6230	919	6240	920	8140	1200	11300	1660	17400	2570	6010 G	886 G
Trans-1,2-Dichloroethylene		< 0.79	< 0.20	< 40	< 10	< 79	< 20	< 7.9	< 2.0	< 16	< 4.0	< 16	< 4.0	< 16	< 4.0
Trichloroethane,1,1,1- (TCA)		< 1.1	< 0.20	85.1	15.6	66.0 J	12.1 J	139 G	25.5 G	262	48.0	467	85.6	44	8.1
Trichloroethylene (TCE)		< 1.1	< 0.20	951	177	505	93.9	2030 G	377 G	3980	740	2930	546	1210	225
Vinyl chloride		< 0.51	< 0.20	< 26	< 10	< 51	< 20	< 5.1	< 2.0	< 10	< 4.0	24	9.5	< 10	< 4.0

General Notes:

1. Analytes detected in at least one sample are reported here. For a complete list of analytes see the attached laboratory data sheets.
2. $\mu g/m^3$ = micrograms per cubic meter.
3. ppbv = parts per billion by volume.
4. "<" = The analyte was not detected at a concentration above the specified laboratory reporting limit.

Qualifying Notes:

G The result is estimated due to duplicate precision outside control limits.

J The reported result is below the laboratory reporting limit and the result is estimated.

Table RC-3
Risk Characterization Data - Soil Vapor
12 Morton Street
Somerville, Massachusetts

	Location:	**MW116**											
	Sample ID:	**MW116**		**MW116**		**SG-MW116**		**MW116-SG**		**MW116-SG**		**MW116-SG2**	
	Sample Date:	**3/20/2007**		**4/11/2007**		**7/17/2007**		**10/9/2007**		**1/30/2008**		**4/14/2008**	
	Units:	**μg/m^3**	**ppbv**	**μg/m^3**	**ppbv**	**μg/m^3**	**ppbv**	**μg/m^3**	**ppbv**	**μg/m^3**	**ppbv**	**μg/m^3**	**ppbv**
Analyte	**Method**												
Volatile Organic Compounds (VOCs)	TO-15												
Carbon tetrachloride		< 63	< 10	< 130	< 20	< 13	< 2.0	< 13	< 2.0	< 25	< 4.0	< 25	< 4.0
Chloroethane		< 26	< 10	< 53	< 20	28	10.6	91.8	34.8	< 11	< 4.0	< 11	< 4.0
Chloroform		NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Dichloroethane,1,1-		378	93.5	923	228	1490 G	367 G	2550	629	482 G	119 G	365	90.3
Dichloroethylene, cis-1,2-		254	64	2620	661	1740 G	438 G	4480	1130	702 G	177 G	265	66.9
Dichloroethylene,1,1-		876	221	1570	395	634 G	160 G	436	110	813 G	205 G	619	156
Tetrachloroethylene (PCE)		11100	1630	21500 G	3170 G	25500 G	3760 G	9630	1420	6600 G	974 G	15700	2320
Trans-1,2-Dichloroethylene		< 40	< 10	< 79	< 20	151	38.1	84.8	21.4	< 16	< 4.0	< 16	< 4.0
Trichloroethane,1,1,1- (TCA)		192	35.2	492	90.2	1020 G	187 G	408	74.8	206	37.7	125	22.9
Trichloroethylene (TCE)		2140	398	6400	1190	2620 G	488 G	2250	419	1830 G	341 G	1820	338
Vinyl chloride		89	34.8	514	201	64.7	25.3	762	298	< 10	< 4.0	< 10	< 4.0

General Notes:

1. Analytes detected in at least one sample are reported here. For a complete list of analytes see the attached laboratory data sheets.
2. μg/m^3 = micrograms per cubic meter.
3. ppbv = parts per billion by volume.
4. "<" = The analyte was not detected at a concentration above the specified laboratory reporting limit.

Qualifying Notes:

G The result is estimated due to duplicate precision outside control limits.

J The reported result is below the laboratory reporting limit and the result is estimated.

Table RC-4
Risk Characterization Data - Outdoor Air
Other Streets Area Exposure Area
Somerville, Massachusetts

	Location Name:	150 Glen-O1					
	Sample Name:	150 GLEN-0-1A		150 GLEN-0-1B		150 GLEN-0-1A	
	Sample Date:	12/27/2006		12/28/2006		1/6/2007	
	Units:	µg/m^3	ppbv	µg/m^3	ppbv	µg/m^3	ppbv
Analyte	**Method**						
Volatile Organic Compounds (VOCs)	TO-15						
Carbon tetrachloride		< 1.3	< 0.20	< 1.3	< 0.20	0.52 J J+	0.083 J J+
Chloroethane		< 0.53	< 0.20	< 0.53	< 0.20	< 0.53	< 0.20
Dichloroethane,1,1-		< 0.81	< 0.20	< 0.81	< 0.20	< 0.81	< 0.20
Dichloroethane,1,2-		< 0.81	< 0.20	< 0.81	< 0.20	< 0.81	< 0.20
Dichloroethylene, cis-1,2-		< 0.79	< 0.20	< 0.79	< 0.20	< 0.79	< 0.20
Dichloroethylene,1,1-		< 0.79	< 0.20	< 0.79	< 0.20	< 0.79	< 0.20
Tetrachloroethylene (PCE)		< 1.4	< 0.20	< 1.4	< 0.20	< 1.4	< 0.20
Trans-1,2-Dichloroethylene		< 0.79	< 0.20	< 0.79	< 0.20	< 0.79	< 0.20
Trichloroethane,1,1,1- (TCA)		< 1.1	< 0.20	< 1.1	< 0.20	< 1.1	< 0.20
Trichloroethylene (TCE)		< 1.1	< 0.20	< 1.1	< 0.20	< 1.1	< 0.20
Vinyl chloride		< 0.51	< 0.20	< 0.51	< 0.20	< 0.51	< 0.20

General Notes:

1. Analytes detected in at least one sample are reported here. For a complete list of analytes see the attached laboratory data sheets.
2. µg/m^3 = micrograms per cubic meter.
3. ppbv = parts per billion by volume.
4. "< " = The analyte was not detected at a concentration above the specified laboratory reporting limit.
5. NT = not tested.

Qualifying Notes:

J The reported result is below the laboratory reporting limit and is estimated.

J+ The reported result is estimated.

Table RC-4
Risk Characterization Data - Outdoor Air
Other Streets Area Exposure Area
Somerville, Massachusetts

	Location Name:	150 Glen-O2					
	Sample Name:	150 GLEN-0-2A		150 GLEN-0-2B		150 GLEN-0-2A	
	Sample Date:	12/27/2006		12/28/2006		1/6/2007	
	Units:	μg/m^3	ppbv	μg/m^3	ppbv	μg/m^3	ppbv
Analyte	**Method**						
Volatile Organic Compounds (VOCs)	TO-15						
Carbon tetrachloride		1.1 J	0.17 J	< 1.3	< 0.20	0.52 J J+	0.082 J J+
Chloroethane		< 0.53	< 0.20	< 0.53	< 0.20	< 0.53	< 0.20
Dichloroethane,1,1-		< 0.81	< 0.20	< 0.81	< 0.20	< 0.81	< 0.20
Dichloroethane,1,2-		< 0.81	< 0.20	< 0.81	< 0.20	< 0.81	< 0.20
Dichloroethylene, cis-1,2-		< 0.79	< 0.20	< 0.79	< 0.20	< 0.79	< 0.20
Dichloroethylene,1,1-		< 0.79	< 0.20	< 0.79	< 0.20	< 0.79	< 0.20
Tetrachloroethylene (PCE)		< 1.4	< 0.20	< 1.4	< 0.20	< 1.4	< 0.20
Trans-1,2-Dichloroethylene		< 0.79	< 0.20	< 0.79	< 0.20	< 0.79	< 0.20
Trichloroethane,1,1,1- (TCA)		< 1.1	< 0.20	< 1.1	< 0.20	< 1.1	< 0.20
Trichloroethylene (TCE)		< 1.1	< 0.20	< 1.1	< 0.20	< 1.1	< 0.20
Vinyl chloride		< 0.51	< 0.20	< 0.51	< 0.20	< 0.51	< 0.20

General Notes:

1. Analytes detected in at least one sample are reported here. For a complete list of analytes see the attached laboratory data sheets.
2. μg/m^3 = micrograms per cubic meter.
3. ppbv = parts per billion by volume.
4. "< " = The analyte was not detected at a concentration above the specified laboratory reporting limit.
5. NT = not tested.

Qualifying Notes:

J The reported result is below the laboratory reporting limit and is estimated.

J+ The reported result is estimated.

Table RC-4
Risk Characterization Data - Outdoor Air
Other Streets Area Exposure Area
Somerville, Massachusetts

	Location Name:	**150 Glen-Roof**					
	Sample Name:	**150 GLEN-ROOF B**		**150 GLEN-ROOF**		**150GLEN-ROOF**	
	Sample Date:	**2/8/2007**		**2/8/2007**		**3/8/2007**	
	Units:	**µg/m³**	**ppbv**	**µg/m³**	**ppbv**	**µg/m³**	**ppbv**
Analyte	**Method**						
Volatile Organic Compounds (VOCs)	TO-15						
Carbon tetrachloride		< 1.3	< 0.20	< 1.3	< 0.20	< 1.3	< 0.20
Chloroethane		< 0.53	< 0.20	< 0.53	< 0.20	< 0.53	< 0.20
Dichloroethane,1,1-		< 0.81	< 0.20	< 0.81	< 0.20	< 0.81	< 0.20
Dichloroethane,1,2-		< 0.81	< 0.20	< 0.81	< 0.20	< 0.81	< 0.20
Dichloroethylene, cis-1,2-		< 0.79	< 0.20	< 0.79	< 0.20	< 0.79	< 0.20
Dichloroethylene,1,1-		< 0.79	< 0.20	< 0.79	< 0.20	< 0.79	< 0.20
Tetrachloroethylene (PCE)		< 1.4	< 0.20	< 1.4	< 0.20	< 1.4	< 0.20
Trans-1,2-Dichloroethylene		< 0.79	< 0.20	< 0.79	< 0.20	< 0.79	< 0.20
Trichloroethane,1,1,1- (TCA)		< 1.1	< 0.20	< 1.1	< 0.20	< 1.1	< 0.20
Trichloroethylene (TCE)		< 1.1	< 0.20	< 1.1	< 0.20	< 1.1	< 0.20
Vinyl chloride		< 0.51	< 0.20	< 0.51	< 0.20	< 0.51	< 0.20

General Notes:
1. Analytes detected in at least one sample are reported here. For a complete list of analytes see the attached laboratory data sheets.
2. µg/m³ = micrograms per cubic meter.
3. ppbv = parts per billion by volume.
4. "< " = The analyte was not detected at a concentration above the specified laboratory reporting limit.
5. NT = not tested.

Qualifying Notes:

J The reported result is below the laboratory reporting limit and is estimated.

J+ The reported result is estimated.

Table RC-4
Risk Characterization Data - Outdoor Air
Other Streets Area Exposure Area
Somerville, Massachusetts

	Location Name:	150 Glen-Roof (continued)					
	Sample Name:	150 GLEN-ROOF		150 GLEN-ROOF		150GLEN-ROOF	
	Sample Date:	4/20/2007		5/17/2007		8/9/2007	
	Units:	$\mu g/m^3$	ppbv	$\mu g/m^3$	ppbv	$\mu g/m^3$	ppbv
Analyte	**Method**						
Volatile Organic Compounds (VOCs)	TO-15						
Carbon tetrachloride		< 1.3	< 0.20	< 1.3	< 0.20	< 1.3	< 0.20
Chloroethane		< 0.53	< 0.20	< 0.53	< 0.20	< 0.53	< 0.20
Dichloroethane,1,1-		< 0.81	< 0.20	< 0.81	< 0.20	< 0.81	< 0.20
Dichloroethane,1,2-		< 0.81	< 0.20	< 0.81	< 0.20	< 0.81	< 0.20
Dichloroethylene, cis-1,2-		< 0.79	< 0.20	< 0.79	< 0.20	< 0.79	< 0.20
Dichloroethylene,1,1-		< 0.79	< 0.20	< 0.79	< 0.20	< 0.79	< 0.20
Tetrachloroethylene (PCE)		< 1.4	< 0.20	< 1.4	< 0.20	< 1.4	< 0.20
Trans-1,2-Dichloroethylene		< 0.79	< 0.20	< 0.79	< 0.20	< 0.79	< 0.20
Trichloroethane,1,1,1- (TCA)		< 1.1	< 0.20	< 1.1	< 0.20	< 1.1	< 0.20
Trichloroethylene (TCE)		< 1.1	< 0.20	< 1.1	< 0.20	< 1.1	< 0.20
Vinyl chloride		< 0.51	< 0.20	< 0.51	< 0.20	< 0.51	< 0.20

General Notes:
1. Analytes detected in at least one sample are reported here. For a complete list of analytes see the attached laboratory data sheets.
2. $\mu g/m^3$ = micrograms per cubic meter.
3. ppbv = parts per billion by volume.
4. "< " = The analyte was not detected at a concentration above the specified laboratory reporting limit.
5. NT = not tested.

Qualifying Notes:

J The reported result is below the laboratory reporting limit and is estimated.

J+ The reported result is estimated.

Table RC-4

Risk Characterization Data - Outdoor Air

Other Streets Area Exposure Area

Somerville, Massachusetts

	Location Name:	150 Glen-Roof (continued)					
	Sample Name:	150GLEN-ROOF		150GLEN-ROOF		150GLEN-ROOF	
	Sample Date:	10/14/2007		11/14/2007		12/17/2007	
	Units:	$\mu g/m^3$	ppbv	$\mu g/m^3$	ppbv	$\mu g/m^3$	ppbv
Analyte	**Method**						
Volatile Organic Compounds (VOCs)	TO-15						
Carbon tetrachloride		< 1.3	< 0.20	< 1.3	< 0.20	< 1.3	< 0.20
Chloroethane		< 0.53	< 0.20	< 0.53	< 0.20	< 0.53	< 0.20
Dichloroethane,1,1-		< 0.81	< 0.20	< 0.81	< 0.20	< 0.81	< 0.20
Dichloroethane,1,2-		< 0.81	< 0.20	< 0.81	< 0.20	< 0.81	< 0.20
Dichloroethylene, cis-1,2-		< 0.79	< 0.20	< 0.79	< 0.20	< 0.79	< 0.20
Dichloroethylene,1,1-		< 0.79	< 0.20	< 0.79	< 0.20	< 0.79	< 0.20
Tetrachloroethylene (PCE)		< 1.4	< 0.20	< 1.4	< 0.20	< 1.4	< 0.20
Trans-1,2-Dichloroethylene		< 0.79	< 0.20	< 0.79	< 0.20	< 0.79	< 0.20
Trichloroethane,1,1,1- (TCA)		< 1.1	< 0.20	< 1.1	< 0.20	< 1.1	< 0.20
Trichloroethylene (TCE)		< 1.1	< 0.20	< 1.1	< 0.20	< 1.1	< 0.20
Vinyl chloride		< 0.51	< 0.20	< 0.51	< 0.20	< 0.51	< 0.20

General Notes:

1. Analytes detected in at least one sample are reported here. For a complete list of analytes see the attached laboratory data sheets.
2. $\mu g/m^3$ = micrograms per cubic meter.
3. ppbv = parts per billion by volume.
4. "< " = The analyte was not detected at a concentration above the specified laboratory reporting limit.
5. NT = not tested.

Qualifying Notes:

J The reported result is below the laboratory reporting limit and is estimated.

J+ The reported result is estimated.

Table RC-4

Risk Characterization Data - Outdoor Air

Other Streets Area Exposure Area
Somerville, Massachusetts

	Location Name:	150 Glen-Roof (continued)					
	Sample Name:	150GLEN-ROOF		150GLEN ROOF		150GLEN-ROOF	
	Sample Date:	1/21/2008		3/17/2008		4/21/2008	
	Units:	$\mu g/m^3$	ppbv	$\mu g/m^3$	ppbv	$\mu g/m^3$	ppbv
Analyte	**Method**						
Volatile Organic Compounds (VOCs)	TO-15						
Carbon tetrachloride		< 1.3	< 0.20	< 1.3	< 0.20	0.69 J	0.11 J
Chloroethane		< 0.53	< 0.20	< 0.53	< 0.20	< 0.53	< 0.20
Dichloroethane,1,1-		< 0.81	< 0.20	< 0.81	< 0.20	< 0.81	< 0.20
Dichloroethane,1,2-		< 0.81	< 0.20	< 0.81	< 0.20	< 0.81	< 0.20
Dichloroethylene, cis-1,2-		< 0.79	< 0.20	< 0.79	< 0.20	< 0.79	< 0.20
Dichloroethylene,1,1-		< 0.79	< 0.20	< 0.79	< 0.20	< 0.79	< 0.20
Tetrachloroethylene (PCE)		< 1.4	< 0.20	< 1.4	< 0.20	< 1.4	< 0.20
Trans-1,2-Dichloroethylene		< 0.79	< 0.20	< 0.79	< 0.20	< 0.79	< 0.20
Trichloroethane,1,1,1- (TCA)		< 1.1	< 0.20	< 1.1	< 0.20	< 1.1	< 0.20
Trichloroethylene (TCE)		< 1.1	< 0.20	< 1.1	< 0.20	< 1.1	< 0.20
Vinyl chloride		< 0.51	< 0.20	< 0.51	< 0.20	< 0.51	< 0.20

General Notes:

1. Analytes detected in at least one sample are reported here. For a complete list of analytes see the attached laboratory data sheets.
2. $\mu g/m^3$ = micrograms per cubic meter.
3. ppbv = parts per billion by volume.
4. "< " = The analyte was not detected at a concentration above the specified laboratory reporting limit.
5. NT = not tested.

Qualifying Notes:

J The reported result is below the laboratory reporting limit and is estimated.
J+ The reported result is estimated.

Table RC-4
Risk Characterization Data - Outdoor Air
Other Streets Area Exposure Area
Somerville, Massachusetts

	Location Name:	150 Glen-Roof (continued)			
	Sample Name:	150GLEN-ROOF		150GLEN-ROOF	
	Sample Date:	2/19/2008		9/10/2007	
	Units:	µg/m^3	ppbv	µg/m^3	ppbv
Analyte	**Method**				
Volatile Organic Compounds (VOCs)	TO-15				
Carbon tetrachloride		< 1.3	< 0.20	0.69 J	0.11 J
Chloroethane		< 0.53	< 0.20	< 0.53	< 0.20
Dichloroethane,1,1-		< 0.81	< 0.20	< 0.81	< 0.20
Dichloroethane,1,2-		< 0.81	< 0.20	< 0.81	< 0.20
Dichloroethylene, cis-1,2-		< 0.79	< 0.20	< 0.79	< 0.20
Dichloroethylene,1,1-		< 0.79	< 0.20	< 0.79	< 0.20
Tetrachloroethylene (PCE)		< 1.4	< 0.20	1.2 J	0.18 J
Trans-1,2-Dichloroethylene		< 0.79	< 0.20	< 0.79	< 0.20
Trichloroethane,1,1,1- (TCA)		< 1.1	< 0.20	< 1.1	< 0.20
Trichloroethylene (TCE)		< 1.1	< 0.20	< 1.1	< 0.20
Vinyl chloride		< 0.51	< 0.20	< 0.51	< 0.20

General Notes:

1. Analytes detected in at least one sample are reported here. For a complete list of analytes see the attached laboratory data sheets.
2. µg/m^3 = micrograms per cubic meter.
3. ppbv = parts per billion by volume.
4. "< " = The analyte was not detected at a concentration above the specified laboratory reporting limit.
5. NT = not tested.

Qualifying Notes:

J The reported result is below the laboratory reporting limit and is estimated.

J+ The reported result is estimated.

Table RC-4
Risk Characterization Data - Outdoor Air
Other Streets Area Exposure Area
Somerville, Massachusetts

	Location Name:	Tufts-O5		Tufts-O6	
	Sample Name:	TUFTS-O-5A		TUFTS-O-6A	
	Sample Date:	10/2/2006		10/2/2006	
	Units:	µg/m^3	ppbv	µg/m^3	ppbv
Analyte	**Method**				
Volatile Organic Compounds (VOCs)	TO-15				
Carbon tetrachloride		< 1.3	< 0.20	< 1.3	< 0.20
Chloroethane		< 0.53	< 0.20	< 0.53	< 0.20
Dichloroethane,1,1-		< 0.81	< 0.20	< 0.81	< 0.20
Dichloroethane,1,2-		< 0.81	< 0.20	< 0.81	< 0.20
Dichloroethylene, cis-1,2-		< 0.79	< 0.20	< 0.79	< 0.20
Dichloroethylene,1,1-		< 0.79	< 0.20	< 0.79	< 0.20
Tetrachloroethylene (PCE)		< 1.4	< 0.20	< 1.4	< 0.20
Trans-1,2-Dichloroethylene		< 0.79	< 0.20	< 0.79	< 0.20
Trichloroethane,1,1,1- (TCA)		< 1.1	< 0.20	< 1.1	< 0.20
Trichloroethylene (TCE)		< 1.1	< 0.20	< 1.1	< 0.20
Vinyl chloride		< 0.51	< 0.20	< 0.51	< 0.20

General Notes:

1. Analytes detected in at least one sample are reported here. For a complete list of analytes see the attached laboratory data sheets.
2. µg/m^3 = micrograms per cubic meter.
3. ppbv = parts per billion by volume.
4. "< " = The analyte was not detected at a concentration above the specified laboratory reporting limit.
5. NT = not tested.

Qualifying Notes:

J The reported result is below the laboratory reporting limit and is estimated.

J+ The reported result is estimated.

Table RC-5
Risk Characterization Data - Indoor Air
12 Morton Street
Somerville, Massachusetts

	Sample Location:	**12 Morton Street**								**12 Morton Street (continued)**							
	Sample Name:	**12MORT-1A**		**12MORT-1B**		**12MORT-B1**		**12MORT-B2**		**12MORT-1A**		**12MORT-1B**		**12MORT-B1**		**12MORT-B2**	
	Sample Date:	3/5/08		3/5/08		3/5/08		3/5/08		3/21/08		3/21/08		3/21/08		3/21/08	
	Units:	$\mu g/m^3$	ppbv	$\mu g/m^3$	ppbv	$\mu g/m^3$	ppbv	$\mu g/m^3$	ppbv	$\mu g/m^3$	ppbv	$\mu g/m^3$	ppbv	$\mu g/m^3$	ppbv	$\mu g/m^3$	ppbv
Analyte	**Method**																
Volatile Organic Compounds (VOCs)	TO-15																
Tetrachloroethylene (PCE)		< 1.4	< 0.20	< 1.4	< 0.20	< 1.4	< 0.20	< 1.4	< 0.20	< 1.4	< 0.20	< 1.4	< 0.20	< 1.4	< 0.20	< 1.4	< 0.20

General Notes:

1. Analytes detected in at least one sample are reported here. For a complete list of analytes see the attached laboratory data sheets.
2. $\mu g/m^3$ = micrograms per cubic meter.
3. ppbv = parts per billion by volume.
4. "<" = The analyte was not detected at a concentration above the specified laboratory reporting limit.
5. On 3/05/08 and 3/21/08 two samples were taken from the 1st Floor (1A and 1B) and two from the basement (B1 and B2).
6. EPEM = Exposure Pathway Elimination Meaure.
7. The samples from March 2010 were collected over a 24-hour period from March 8 through 9, 2010.
8. The samples from November 2010 were collected over a 24-hour period from November 18 through 19, 2010.
9. No pre-EPEM indoor air samples were collected. The EPEM was installed based on sub-slab soil vapor testing results.

Qualifying Note:

J The reported result is below the laboratory reporting limit and is estimated.

Table RC-5
Risk Characterization Data - Indoor Air
12 Morton Street
Somerville, Massachusetts

	Sample Location:	12 Morton Street (continued)								12 Morton Street (continued)			
	Sample Name:	12MORT-1		12MORT-B		12MORT-1		12MORT-B		12MORT-1		12MORT-B	
	Sample Date:	4/3/09		4/3/09		3/9/10		3/9/10		11/19/10		11/19/10	
	Units:	µg/m^3	ppbv	µg/m^3	ppbv	µg/m^3	ppbv	µg/m^3	ppbv	µg/m^3	ppbv	µg/m^3	ppbv
Analyte	**Method**												
Volatile Organic Compounds (VOCs)	TO-15												
Tetrachloroethylene (PCE)		< 1.4	< 0.20	< 1.4	< 0.20	< 1.4	< 0.20	1.4	0.21	< 1.4	< 0.20	< 1.4	< 0.20

General Notes:
1. Analytes detected in at least one sample are reported here. For a complete list of analytes see the attached laboratory data sheets.
2. µg/m^3 = micrograms per cubic meter.
3. ppbv = parts per billion by volume.
4. "<" = The analyte was not detected at a concentration above the specified laboratory reporting limit.
5. On 3/05/08 and 3/21/08 two samples were taken from the 1st Floor (1A and 1B) and two from the basement (B1 and B2).
6. EPEM = Exposure Pathway Elimination Meaure.
7. The samples from March 2010 were collected over a 24-hour period from March 8 through 9, 2010.
8. The samples from November 2010 were collected over a 24-hour period from November 18 through 19, 2010.
9. No pre-EPEM indoor air samples were collected. The EPEM was installed based on sub-slab soil vapor testing results.

Qualifying Note:

J The reported result is below the laboratory reporting limit and is estimated.

Table RC-6
Toxicity Information
12 Morton Street
Somerville, Massachusetts

Compound	Reference Dose Oral Chronic Value (mg/kg-day)	Reference Dose Oral Subchronic Value (mg/kg-day)	Reference Concentration Inhalation Chronic Value (mg/m^3)	Reference Concentration Inhalation Subchronic Value (mg/m^3)	Cancer Slope Factor Oral Value (mg/kg-day)$^{-1}$	Unit Risk Inhalation Value (ug/m^3)$^{-1}$	Cancer Slope Factor Inhalation Value (mg/kg-day)$^{-1}$
Carbon tetrachloride	0.0007	0.007	0.43	0.43	0.13	0.000015	0.0525
Chloroethane	0.4^1	0.4^1	10^2	10^2	NA	NA	NA
Chloroform	0.01	0.01	0.66	0.66	NA	0.000023	0.0805
Dichloroethane,1,1-	0.1	1	0.5	5	NA	NA	NA
Dichloroethene, cis-1,2-	0.01	0.1	0.035	0.035	NA	NA	NA
Dichloroethene,1,1-	0.05	0.05	0.2	0.2	NA	NA	1.2
Tetrachloroethene	0.01	0.1	4.6	4.6	0.051	0.00001	0.035
Trans-1,2-Dichloroethene	0.02	0.2	0.07	0.7	NA	NA	NA
Trichloroethane,1,1,1-	0.09	0.9	5.2	5.2	NA	NA	NA
Trichloroethene	0.002	0.02	0.18	0.18	0.011	0.0000017	0.00595
Vinyl chloride	0.003	0.003	0.1	0.1	1.4	0.0000088	0.0308

General Notes:

1. Region 9 Preliminary Remediation Goals (http://www.epa.gov/region09/waste/sfund/prg/index.html)
2. IRIS (http://cfpub.epa.gov/ncea/iris/index.cfm), checked on April 8, 2008.
3. All other values obtained from MassDEP (2008b,c)
4. NA = Not Applicable/Not a classified carcinogen

Table RC-7

Exposure Point Concentrations (EPCs) on Other Streets Area (Worst Case)

12 Morton Street
Somerville, Massachusetts

Sample Type:	Soil	Soil	Groundwater	Soil Vapor	Outdoor Air	Indoor Air
	Maximum 0-3'	Maximum 0-15'	Maximum of Temporal Averages	Maximum of Temporal Averages		Spatial and Temporal Average
Unit:	mg/kg	mg/kg	µg/l	µg/m^3	µg/m^3	mg/m^3
Analyte						
Volatile Organic Compounds (VOCs)						
Carbon tetrachloride	0.049	0.037	0.50	870	**	**
Chloroethane	0.12	0.095	15	360	**	**
Chloroform	0.049	0.037	8.9	NA	**	**
Dichloroethane,1,1-	0.13	0.43	77	1000	0.47	4.1E-04
Dichloroethylene, cis-1,2-	0.049	0.77	200	1700	0.46	4.0E-04
Dichloroethylene,1,1-	0.049	0.49	43	1300	0.46	4.0E-04
Tetrachloroethylene (PCE)	0.99	59	6700	330000	0.82	7.2E-04
Trans-1,2-Dichloroethylene	0.049	0.037	7.6	550	0.46	4.0E-04
Trichloroethane,1,1,1- (TCA)	0.077	0.077	91	3700	0.64	5.5E-04
Trichloroethylene (TCE)	0.36	6.2	150	2800	0.64	5.5E-04
Vinyl chloride	0.049	0.037	58	350	0.30	2.6E-04

General Notes:

1. mg/kg = milligrams per kilogram.
2. µg/l = micrograms per liter.
3. µg/m^3 = micrograms per cubic meter.
4. mg/m^3 = milligrams per cubic meter.
5. NA = no data were available for this compound in this medium.
6. ** = compound is not a COPC for this medium.
7. For 0-3 foot soil EPCs, MW101S1 is the location of the maximum concentration for PCE & TCE. Concentrations for all other COPCs are 1/2 the maximum detection limit.
8. For 0-15 foot soil EPCs, 95RFRANK-EASTFILL is the location of the maximum concentration for 1.1-dichloroethane. 95RSUBSOIL is the location of the maximum concentration for cis-1,2-dichloroethylene. 95FRANK-SOUTH FILL is the location of the maximum concentration for 1,1-dichloroethylene, PCE, and TCE. Concentrations for all other COPCs are 1/2 the maximum detection limit.
9. For groundwater EPCs, MW111 is the location of the maximum concentration for chloroethane, chloroform, PCE, and trans-1,2-dichloroethylene. MW116 is the location of the maximum concentration for 1,1-dichloroethane, cis-1,2-dichloroethylene, 1,1-dichloroethylene, TCE, and vinyl chloride. MW101 is the location of the maximum concentration for TCA. The concentration for carbon tetrachloride is 1/2 the maximum detection limit.
10. For soil vapor EPCs, MW111 is the location of the maximum concentration for carbon tetrachloride, chloroethane, PCE, trans-1,2-dichloroethylene, TCA, and vinyl chloride. MW116 is the location of the maximum concentration for 1,1-dichloroethane, cis-1,2-dichloroethylene, and TCE. MW112 is the location of the maximum concentration for 1,1-dichloroethylene.
11. The indoor air EPC for PCE is the temporal average of spatially averaged post-EPEM concentrations assuming 20 hours on the first floor and 4 hours in the basement. Concentrations for all other COPCs are 1/2 the detection limit.

Table RC-8

Relative Absorption Factors

12 Morton Street

Somerville, Massachusetts

Compound	Relative Absorption Factor Soil Ingestion Non-Cancer Chronic	Relative Absorption Factor Soil Dermal Non-Cancer Chronic	Relative Absorption Factor Soil Ingestion Non-Cancer Subchronic	Relative Absorption Factor Soil Dermal Non-Cancer Subchronic	Relative Absorption Factor Soil Ingestion Cancer	Relative Absorption Factor Soil Dermal Cancer	Relative Absorption Factor Water Ingestion Non-Cancer Subchronic	Relative Absorption Factor Water Ingestion Non-Cancer Chronic	Relative Absorption Factor Water Ingestion Cancer
Carbon tetrachloride	1	0.1	1	0.1	1	0.1	1	1	1
Chloroethane	1	0.1	1	0.1	NC	NC	1	1	NC
Chloroform	1	0.1	1	0.1	NA	NA	1	1	NC
Dichloroethane,1,1-	1.3	0.13	1.3	0.13	NC	NC	1.3	1.3	NC
Dichloroethene, cis-1,2-	1	0.1	1	0.1	NC	NC	1	1	NC
Dichloroethene,1,1-	1	0.1	1	0.1	NC	NC	1	1	NC
Tetrachloroethene	1	0.1	1	0.1	1	0.1	1	1	1
Trans-1,2-Dichloroethene	1	0.1	1	0.1	NC	NC	1	1	NC
Trichloroethane,1,1,1-	1	0.1	1	0.1	NC	NC	1	1	NC
Trichloroethene	1	0.1	1	0.1	1	0.1	1	1	1
Vinyl chloride	1	0.1	1	0.1	1.53	0.16	1	1	1.53

General Notes:

1. NC - Not calculated
2. Values obtained from MassDEP.

Table RC-8

Relative Absorption Factor

12 Morton Street

Somerville, Massachusetts

Compound	Relative Absorption Factor Water Dermal Cancer	Relative Absorption Factor Water Dermal Non-Cancer Chronic	Relative Absorption Factor Water Dermal Non-Cancer Subchronic	Relative Absorption Factor Air Inhalation Cancer	Relative Absorption Factor Air Inhalation Non-Cancer Chronic	Relative Absorption Factor Air Inhalation Non-Cancer Subchronic
Carbon tetrachloride	1	1	1	1	1	1
Chloroethane	NC	1	1	NC	1	1
Chloroform	NC	1	1	1	1	1
Dichloroethane,1,1-	NC	1	1	NC	1	1
Dichloroethene, cis-1,2-	NC	1	1	NC	1	1
Dichloroethene,1,1-	NC	1	1	1	1	1
Tetrachloroethene	1	1	1	1	1	1
Trans-1,2-Dichloroethene	NC	1	1	NC	1	1
Trichloroethane,1,1,1-	NC	1	1	NC	1	1
Trichloroethene	1	1	1	1	1	1
Vinyl chloride	1	1	1	1	1	1

General Notes:

1. NC - Not calculated
2. Values obtained from MassD

Table RC-9
Chemical/Physical Properties
12 Morton Street
Somerville, Massachusetts

	S		H		H'		MW		VP		logK$_{ow}$		K$_{oc}$		MP		C$_{sat}$		K$_p$	
Compound	Solubility (ug/L)	Solubility (ug/L) Source	Henry's Law Constant (atm-m^3/mole)	Henry's Law Constant (atm-m^3/mole) Source	Henry's Law Constant (dimensionless)	Henry's Law Constant (dimensionless) Source	Molecular Weight (g/mole)	Molecular Weight (g/mole) Source	Vapor Pressure (mm Hg)	Vapor Pressure (mm Hg) Source	Log (Octanol-Water Partition Coefficient (cm^3/g))	Log (Octanol-Water Partition Coefficient (cm^3/g)) Source	Organic Carbon-Water Partition Coefficient (cm^3/g)	Organic Carbon-Water Partition Coefficient (cm^3/g) Source	Melting Point (degrees C)	Melting Point (degrees C) Source	Soil Saturation Concentration (mg/kg)	Soil Saturation Concentration (mg/kg) Source	Dermal Permeability Constant (cm/hr)	Dermal Permeability Constant (cm/hr) Source
Carbon tetrachloride	793000	1	0.0276	1	1.129481093	1	154	2	113	7	2.83	4	152	5	-23	3	969.7093213	7	0.016047227	1
Chloroethane	6710000	1	0.0111	1	0.445	7	64.52	7	1010	1	1.43	7	23.74	7	-138.7	7	1500	7	0.006060215	7
Chloroform	7950000	1	0.00367	1	0.150188247	1	119	2	160	7	1.97	4	52.5	5	-63.6	3	3522.129358	7	0.0068	1
Dichloroethane,1,1-	5040000	1	0.00562	1	0.229988541	1	99	2	234	7	1.79	4	53.4	5	-96.9	3	2335.18922	7	0.006714289	1
Dichloroethene, cis-1,2-	6410000	1	0.00408	1	0.16696677	1	97	2	202	7	1.76	3	35.5	5a	-80	3	2206.111306	7	0.006582638	6
Dichloroethene,1,1-	2420000	1	0.0261	1	1.068096251	1	97	2	591	7	1.48	4	65	5	-122.5	3	1668.29468	7	0.004301303	1
Tetrachloroethene	206000	1	0.0177	1	0.724341136	1	166	2	19	7	3.4	4	265	5	-22.3	3	375.9933312	7	0.032688877	1
Trans-1,2-Dichloroethene	4520000	1	0.00938	1	0.383859879	1	97	2	331	7	2.09	4	38	5	-49.8	3	1806.435375	7	0.010869261	1
Trichloroethane,1,1,1-	1290000	1	0.0172	1	0.703879522	1	133	2	100	7	2.49	4	135	5	-30.4	3	1343.394189	7	0.012548736	1
Trichloroethene	1280000	1	0.00985	1	0.403093796	1	131	2	77	7	2.42	4	94.3	5	-84.7	3	948.5365443	7	0.011577106	1
Vinyl chloride	8800000	1	0.0278	1	1.137665739	1	63	2	2580	7	1.62	4	18.6	5a	-153.7	3	3730.885587	7	0.008248975	1

General Notes:

1	Syracuse Research Corporation (http://www.syrres.com/esc/physdemo.htm)
2	ATSDR, "Toxicological Profile for ______________"; Agency for Toxic Substances and Disease Registry, U.S. Public Health Service.
3	US EPA Soil Screening Guidance: Technical Background Document, EPA/540/R95/128, May 1996
4	OSHA Documentation of TLV -TWA
5	Measured Koc from the SSL Guidance, Table 39
5a	Calculated Koc from the SSL Guidance, Table 39
6	http://chemfinder.cambridgesoft.com
7	Risk Assessment Information System (RAIS), http://rais.oml.gov/

Table RC-9
Chemical/Physical Properties
12 Morton Street
Somerville, Massachusetts

	D_a		D_w		t_H		BP		t_{crit}		$\Delta H_{v,b}$		$\Delta H_{v,TS}$	H_{TS}	H'_{TS}	D^{eff}_{VA}	D^{eff}_{VB}	D^{eff}_{VT}	D^{eff}_{crack}	D^{eff}_{CZ}	D^{eff}_{T}	SDF
Compound	Diffusivity In Air (cm^2/sec)	Diffusivity in Air (cm^2/sec) Source	Diffusivity in Water (cm^2/sec)	Diffusivity in Water (cm^2/sec) Source	Henry's Law Constant Reference Temperature (degrees C)	Henry's Law Constant Reference Temperature (degrees C) Source	Normal Boiling Point (degrees K)	Normal Boiling Point (degrees K) Source	Critical Temperature (degrees K)	Critical Temperature (degrees K) Source	Enthalpy of Vaporization at Normal Boiling Point (cal/mole)	Enthalpy of Vaporization at Normal Boiling Point (cal/mole) Source	Enthalpy of Vaporization at Avg GW Temp (cal/mole)	Henry's Law Constant at Avg GW Temp (atm-m^3/mol)	Henry's Law Constant at Avg GW Temp (conc/conc)	Effective Diffusivity in Vadose Zone Layer A (adj to bldg) (cm^2/sec)	Effective Diffusivity in Vadose Zone Layer B (intermediate) (cm^2/sec)	Effective Diffusivity in Vadose Zone Total (cm^2/sec)	Effective Diffusivity in Crack (cm^2/sec)	Effective Diffusivity in Capillary Zone (cm^2/sec)	Effective Diffusivity Total (cm^2/sec)	Source Dilution Factor (unitless)
Carbon tetrachloride	0.078	7	0.0000088	7	25	7	349.9	7	556.6	7	7127	7	7859	0.01366935	0.588373	0.0153911	0.015391099	0.0153911	0.0153911	1.32E-03	5.69E-03	1
Chloroethane	0.271	7	0.0000115	7	24	7	285.45	7	460.15	7	24.65	7	25	0.01107701	0.4767903	0.05347419	0.05347419	0.0534742	0.0534742	4.57E-03	1.98E-02	1
Chloroform	0.104	7	0.00001	7	25	7	334.32	7	536.4	7	6988	7	7554	0.00186777	0.08039478	0.02052151	0.020521513	0.0205215	0.0205215	1.76E-03	7.60E-03	1
Dichloroethane,1,1-	0.0742	7	0.0000105	7	25	7	330.55	7	523	7	6895	7	7450	0.00288694	0.12426307	0.01464131	0.014641309	0.0146413	0.0146413	1.26E-03	5.42E-03	1
Dichloroethene, cis-1,2-	0.0736	7	0.0000113	7	25	7	333.65	7	544	7	7192	7	7734	0.00204327	0.08794896	0.01452294	0.014522936	0.0145229	0.0145229	1.25E-03	5.39E-03	1
Dichloroethene,1,1-	0.09	7	0.0000104	7	25	7	304.75	7	576.05	7	6247	7	6392	0.01473742	0.63434624	0.01775896	0.01775896	0.017759	0.017759	1.52E-03	6.56E-03	1
Tetrachloroethene	0.072	7	0.0000082	7	25	7	394.4	7	620.2	7	8288	7	9553	0.0075339	0.32428336	0.01420717	0.014207173	0.0142072	0.0142072	1.21E-03	5.25E-03	1
Trans-1,2-Dichloroethene	0.0707	7	0.0000119	7	25	7	320.85	7	516.5	7	6717	7	7136	0.00495551	0.213301	0.01395067	0.013950669	0.0139507	0.0139507	1.19E-03	5.16E-03	1
Trichloroethane,1,1,1-	0.078	7	0.0000088	7	25	7	347.24	7	545	7	7136	7	7885	0.00849864	0.36580874	0.0153911	0.015391103	0.0153911	0.0153911	1.32E-03	5.69E-03	1
Trichloroethene	0.079	7	0.0000091	7	25	7	360.36	7	544.2	7	7505	7	8557	0.00458318	0.19727504	0.01558843	0.015588435	0.0155884	0.0155884	1.33E-03	5.77E-03	1
Vinyl chloride	0.106	7	1.23E-06	7	25	7	259.25	7	432	7	5250	7	5000	0.01777872	0.76525335	0.0209161	0.0209161	0.0209161	0.0209161	1.79E-03	7.73E-03	1

General Notes:

1	Syracuse Research Corporation (http://www.syrres.com/esc/physdemo.htm)
2	ATSDR, "Toxicological Profile for _______________"; Agency for Toxic Substances and Disease Registry, U.S. Public Health Service.
3	US EPA Soil Screening Guidance: Technical Background Document, EPA/540/R95/128, May 1996
4	OSHA Documentation of TLV -TWA
5	Measured Koc from the SSL Guidance, Table 39
5a	Calculated Koc from the SSL Guidance, Table 39
6	http://chemfinder.cambridgesoft.com
7	Risk Assessment Information System (RAIS), http://rais.ornl.gov/

Table RC-10
Summary of Potential Risks at 12 Morton Street
12 Morton Street
Somerville, Massachusetts

Exposure Pathways	Non-Carcinogenic Risk	Carcinogenic Risk
Current Resident at 12 Morton Street (Outdoor)		
Soil ingestion and dermal	2E-03	1E-07
Soil particulate	6E-07	2E-10
Ambient Air (outdoor air)	2E-03	5E-07
Cumulative outdoor risks	4E-03	6E-07
Future Resident at 12 Morton Street (Outdoor)		
Soil ingestion and dermal	4E-02	2E-06
Soil particulate	2E-05	5E-09
Ambient Air (outdoor air)	2E-03	5E-07
Cumulative outdoor risks	4E-02	3E-06
Indoor/Outdoor Resident at 12 Morton Street		
Indoor Air	2E-02	4E-06
Homebound Resident at 12 Morton Street		
Indoor Air	3E-02	4E-06
Current Resident at 12 Morton Street (Cumulative)		
Cumulative Outdoor and Indoor Risks	3E-02	5E-06
Future Resident at 12 Morton Street (Cumulative)		
Cumulative Outdoor and Indoor Risks	7E-02	7E-06
Construction Worker at 12 Morton Street		
Soil ingestion and dermal	2E-03	6E-08
Soil particulate	3E-05	9E-10
Excavation Air (average of soil, groundwater and soil vapor)	9E-03	1E-06
Cumulative Risk	1E-02	1E-06

Appendix **A**

Risk Equations and Calculations

Table A-1
Exposure and Risk Estimates Associated With Soil Contact
50 Tufts Street, Somerville MA
UniFirst
Current Resident at other streets
Soil

Receptor:	Resident ▼
Medium:	Soil ▼
Exposure Area:	Current ▼
Depth:	0-3 feet ▼
Duration:	Chronic ▼

Parameter	Definition	Units	Value	Comment
IRsoil	Soil Ingestion Rate	mg/d	100	
IRsoilTWA	Soil TWA Ingestion Rate	mg-y/kg-d	64	
SA	Soil Dermal Contact Skin Exposed	cm2/d	2431	
SATWA	Soil TWA Dermal Contact Skin Exposed	mg-cm2-y/kg-d-cı	659	
AF	Soil Dermal Contact Adherence Rate	mg/cm2	0.35	
EF	Soil Exposure Frequency	d/y	150	
EPc	Soil Exposure Period - Cancer	y	30	
EPnc	Soil Exposure Period - Non-Cancer	y	7	
ATc	Soil Averaging Time - Cancer	d	25550	
ATn	Soil Averaging Time - Non-Cancer	d	2555	
BW	Body Weight	kg	17	
CF	Conversion Factor	kg/mg	0.000001	

$$ADD_{ing} = \frac{C_{soil} \times CF \times IR_{soil} \times RAF_{os} \times EF \times EP}{AP \times BW}$$

$$ADD_{der-nc} = \frac{C_{soil} \times CF \times SA \times AF \times RAF_{ds} \times EF \times EP}{AP \times BW}$$

$$ADD_{ing-c} = \frac{C_{soil} \times CF \times IR_{soil}TWA \times RAF_{os} \times EF}{AP}$$

$$ADD_{der-c} = \frac{C_{soil} \times CF \times SATWA \times RAF_{ds} \times EF}{AP}$$

$$HI_{ing} = \frac{ADD_{ing-nc}}{RfD}$$

$$HI_{der} = \frac{ADD_{der-nc}}{RfD}$$

$$HI = HI_{ing} + HI_{der}$$

$$Risk_{ing} = ADD_{ing-c} \times CS$$

$$Risk_{der} = ADD_{der-c} \times CSF$$

$$Risk = Risk_{ing} + Risk_{der}$$

	EPC			Incidental Ingestion						Dermal Contact						Total	
Compound	Soil (mg/kg)	RfD (mg/kg-d)	CSF 1/(mg/kg-d)	RAFosc	ADDing-c mg/kg-d	Risking	RAFosnc	ADDing-nc mg/kg-d	Hling	RAFdsc	ADDder-c mg/kg-d	Riskder	RAFdsnc	ADDder-nc mg/kg-d	Hlder	Risk (Soil) YC-OC-A	HI (Soil) YC
Carbon tetrachloride	4.9E-02	0.0007	0.13	1	2E-08	2E-09	1	1E-07	2E-04	0.1	2E-08	2E-09	0.1	1E-07	1E-04	5E-09	3E-04
Chloroethane	1.2E-01	0.4	NA	NC	NA	NA	1	3E-07	7E-07	NC	NA	NA	0.1	2E-07	6E-07	NA	1E-06
Chloroform	4.9E-02	0.01	NA	NA	NA	NA	1	1E-07	1E-05	NA	NA	NA	0.1	1E-07	1E-05	NA	2E-05
Dichloroethane,1,1-	1.3E-01	0.1	NA	NC	NA	NA	1.3	4E-07	4E-06	NC	NA	NA	0.13	3E-07	3E-06	NA	8E-06
Dichloroethene, cis-1,2-	4.9E-02	0.01	NA	NC	NA	NA	1	1E-07	1E-05	NC	NA	NA	0.1	1E-07	1E-05	NA	2E-05
Dichloroethene,1,1-	4.9E-02	0.05	NA	NC	NA	NA	1	1E-07	2E-06	NC	NA	NA	0.1	1E-07	2E-06	NA	4E-06
Tetrachloroethene	9.9E-01	0.01	0.051	1	4E-07	2E-08	1	2E-06	2E-04	0.1	4E-07	2E-08	0.1	2E-06	2E-04	4E-08	4E-04
Trans-1,2-Dichloroethene	4.9E-02	0.02	NA	NC	NA	NA	1	1E-07	6E-06	NC	NA	NA	0.1	1E-07	5E-06	NA	1E-05
Trichloroethane,1,1,1-	7.7E-02	0.09	NA	NC	NA	NA	1	2E-07	2E-06	NC	NA	NA	0.1	2E-07	2E-06	NA	4E-06
Trichloroethene	3.6E-01	0.002	0.011	1	1E-07	1E-09	1	9E-07	4E-04	0.1	1E-07	2E-09	0.1	7E-07	4E-04	3E-09	8E-04
Vinyl chloride	4.9E-02	0.003	1.4	1.53	3E-08	4E-08	1	1E-07	4E-05	0.16	3E-08	4E-08	0.1	1E-07	3E-05	8E-08	7E-05
Total						6E-08			9E-04			7E-08			8E-04	1E-07	2E-03

NA - Not available
NC - Not calculated
ND - Not detected

Table A-2
Exposure and Risk Estimates Associated With Inhalation of Soil-Derives Particulates in Air
50 Tufts Street, Somerville MA
UniFirst
Current Resident at other streets
Ambient Air

Receptor:	Resident
Medium of Origin:	Soil
Exposure Medium:	Ambient Air
Exposure Area:	Current
Depth:	0-3 feet
Duration:	Chronic

Parameter	Definition	Units	Value	Comment
IRair	Outdoor Air Inhalation Rate - Particulates	m3/hr	0.4	
IRairTWA	Outdoor Air TWA Inhalation Rate - Particulates	m3-y/h-kg	0.6	
PEF	Outdoor Air PM10 - Particulates	ug/m3	32	
ET	Outdoor Air Exposure Time - Particulates	hr/d	8	
EF	Outdoor Air Exposure Frequency - Particulates	d/y	150	
EP	Outdoor Air Exposure Period - Cancer - Particulates	y	30	
EP	Outdoor Air Exposure Period - Non-Cancer - Particulates	y	7	
ATc	Outdoor Air Averaging Time - Cancer - Particulates	d	25550	
ATn	Outdoor Air Averaging Time - Non-Cancer - Particulates	d	2555	
BW	Body Weight	kg	17	
C	Conversion Factor	ug/mg	1000	

$$C_{air} = C_{soil} \times PM_{10}$$

$$ADD_{inh-gi-c} = \frac{C_{air} \times 1.5 \times IR_{air} \times RAF_{ic} \times ET \times EF \times EP \times C}{AP \times BW}$$

$$ADD_{inh-gi-nc} = \frac{C_{air} \times 1.5 \times IR_{air} TWA \times RAF_{inc} \times ET \times EF \times C}{AP}$$

$$ADD_{inh-c} = \frac{C_{air} \times 0.5 \times IR_{air} \times RAF_{ic} \times ET \times EF \times EP \times C}{AP \times BW}$$

$$ADD_{inh-nc} = \frac{C_{air} \times 0.5 \times IR_{air} TWA \times RAF_{inc} \times ET \times EF \times C}{AP}$$

$$ADE_{inh} = \frac{ADD_{inh} \times 70kg}{20m^3 / d}$$

$$HI = \frac{ADD_{inh-gi-nc}}{RfD} + \frac{ADE_{inh-nc}}{RfC}$$

$$Risk = (ADD_{inh-gi-c} \times CSF) + (ADE_{inh-c} \times URF \times C)$$

Compound	EPC Soil (mg/kg)	EPC Fugitive Dust (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	RfD (mg/kg-d)	CSF 1/(mg/kg-d)	RAFic	ADD-inhc mg/kg-d	ADE-c mg/m3	Riskinh	ADD-ingc	Risking	RAFinc	ADD-inhnc mg/kg-d	ADE-nc mg/m3	HIinh	ADD-ingnc	HIing	Risk (Particulates in Air) YC-OC-A	HI (Particulates in Air) YC
Carbon tetrachloride	4.9E-02	1.6E-09	0.43	0.000015	0.0007	0.13	1	2E-11	8E-11	1E-12	9E-11	1E-11	1	5E-11	2E-10	4E-10	2E-10	2E-07	1E-11	2E-07
Chloroethane	1.2E-01	3.8E-09	10	NA	0.4	NA	NC	NA	NA	NA	NA	NA	1	1E-10	5E-10	5E-11	4E-10	1E-09	NA	1E-09
Chloroform	4.9E-02	1.6E-09	0.66	0.000023	0.01	NA	1	2E-11	8E-11	2E-12	NA	NA	1	5E-11	2E-10	3E-10	2E-10	2E-08	2E-12	2E-08
Dichloroethane,1,1-	1.3E-01	4.2E-09	0.5	NA	0.1	NA	NC	NA	NA	NA	NA	NA	1	1E-10	5E-10	1E-09	4E-10	4E-09	NA	5E-09
Dichloroethene, cis-1,2-	4.9E-02	1.6E-09	0.035	NA	0.01	NA	NC	NA	NA	NA	NA	NA	1	5E-11	2E-10	5E-09	2E-10	2E-08	NA	2E-08
Dichloroethene,1,1-	4.9E-02	1.6E-09	0.2	NA	0.05	NA	1	NA	NA	NA	NA	NA	1	5E-11	2E-10	9E-10	2E-10	3E-09	NA	4E-09
Tetrachloroethene	9.9E-01	3.2E-08	4.6	0.00001	0.01	0.051	1	4E-10	2E-09	2E-11	2E-09	9E-11	1	1E-09	4E-09	8E-10	3E-09	3E-07	1E-10	3E-07
Trans-1,2-Dichloroethene	4.9E-02	1.6E-09	0.07	NA	0.02	NA	NC	NA	NA	NA	NA	NA	1	5E-11	2E-10	3E-09	2E-10	8E-09	NA	1E-08
Trichloroethane,1,1,1-	7.7E-02	2.5E-09	5.2	NA	0.09	NA	NC	NA	NA	NA	NA	NA	1	9E-11	3E-10	6E-11	3E-10	3E-09	NA	3E-09
Trichloroethene	3.6E-01	1.1E-08	0.18	0.0000017	0.002	0.011	1	2E-10	6E-10	1E-12	6E-10	7E-12	1	4E-10	1E-09	8E-09	1E-09	6E-07	8E-12	6E-07
Vinyl chloride	4.9E-02	1.6E-09	0.1	0.0000088	0.003	1.4	1	2E-11	8E-11	7E-13	9E-11	1E-10	1	5E-11	2E-10	2E-09	2E-10	5E-08	1E-10	6E-08
Total										2E-11		2E-10				2E-08		1E-06	3E-10	1E-06

NA - Not available
NC - Not calculated
ND - Not detected

Table A-3
Exposure and Risk Estimates Associated With Inhalation of Volatile Compounds in Air
50 Tufts Street, Somerville MA
UniFirst
Current Resident at other streets
Ambient Air

Receptor:	Resident ▼
Medium of Origin:	Ambient Air ▼
Exposure Medium:	Ambient Air ▼
Exposure Area:	Current ▼
Depth:	Shallow ▼
Duration:	Chronic ▼

$$C_{air} = \frac{C_{source} \times VF}{SDF}$$

$$ADE_{inh} = \frac{C_{air} \times RAF_i \times ET \times EF \times EP}{24\,hr/d \times 365\,d/y \times AT}$$

$$HI_{inh} = \frac{ADE_{inh}}{RfC}$$

$$Risk = ADE_{inh} \times URF \times C$$

Parameter	Definition	Units	Value	Comment
ET	Outdoor Air Exposure Time - Volatiles	hr/d	8	
EF	Outdoor Air Exposure Frequency - Volatiles	d/y	150	
EP	Outdoor Air Exposure Period - Non-Cancer - Volatiles	y	7	
EP	Outdoor Air Exposure Period - Cancer - Volatiles	y	30	
ATc	Outdoor Air Averaging Time - Cancer - Volatiles	d	25550	
ATn	Outdoor Air Averaging Time - Non-Cancer - Volatiles	d	2555	
C	Conversion Factor	ug/mg	1000	

	Outdoor Air Data										
Compound	Ambient Air (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	RAFic	ADE-c mg/m3	Riskinh	RAFinc	ADE-nc mg/m3	HIinh	Risk (Ambient Air)	HI (Ambient Air)
Carbon tetrachloride	NA	0.43	0.000015	1	NA	NA	1	NA	NA	NA	NA
Chloroethane	NA	10	NA	NC	NA	NA	1	NA	NA	NA	NA
Chloroform	NA	0.66	0.000023	1	NA	NA	1	NA	NA	NA	NA
Dichloroethane,1,1-	4.7E-04	0.5	NA	NC	NA	NA	1	6E-05	1E-04	NA	1E-04
Dichloroethene, cis-1,2-	4.6E-04	0.035	NA	NC	NA	NA	1	6E-05	2E-03	NA	2E-03
Dichloroethene,1,1-	4.6E-04	0.2	NA	1	NA	NA	1	6E-05	3E-04	NA	3E-04
Tetrachloroethene	8.2E-04	4.6	0.00001	1	5E-05	5E-07	1	1E-04	2E-05	5E-07	2E-05
Trans-1,2-Dichloroethene	4.6E-04	0.07	NA	NC	NA	NA	1	6E-05	9E-04	NA	9E-04
Trichloroethane,1,1,1-	6.4E-04	5.2	NA	NC	NA	NA	1	9E-05	2E-05	NA	2E-05
Trichloroethene	6.4E-04	0.18	0.0000017	1	4E-05	6E-08	1	9E-05	5E-04	6E-08	5E-04
Vinyl chloride	3.0E-04	0.1	0.0000088	1	2E-05	2E-07	1	4E-05	4E-04	2E-07	4E-04
Total						7E-07			4E-03	7E-07	4E-03

NA - Not available
NC - Not calculated
ND - Not detected

Table A-4
Exposure and Risk Estimates Associated With Soil Contact
50 Tufts Street, Somerville MA
UniFirst
Construction Worker at other streets
Soil - Dermal contact & Incidential Ingestion

Receptor:	Construction Worker ▼
Medium:	Surface Soil ▼
Exposure Area:	Excavation ▼
Depth:	0-15 feet ▼
Duration:	Subchronic ▼

Parameter	Definition	Units	Value	Comment
IRsoil	Soil Ingestion Rate	mg/d	100	
SA	Soil Dermal Contact Skin Exposed	cm2/d	3473	
AF	Soil Dermal Contact Adherence Rate	mg/cm2	0.29	
EF	Soil Exposure Frequency	d/y	130	
EP	Soil Exposure Period - Cancer	y	1	
EP	Soil Exposure Period - Non-Cancer	y	1	
ATc	Soil Averaging Time - Cancer	d	25550	
ATn	Soil Averaging Time - Non-Cancer	d	182	
BW	Body Weight	kg	58	
CF	Conversion Factor	kg/mg	0.000001	

$$ADD_{ing} = \frac{C_{soil} \times CF \times IR_{soil} \times RAF_{os} \times EF \times EP}{AP \times BW}$$

$$ADD_{der} = \frac{C_{soil} \times CF \times SA \times AF \times RAF_{ds} \times EF \times EP}{AP \times BW}$$

$$HI_{ing} = \frac{ADD_{ing}}{RfD}$$

$$HI_{der} = \frac{ADD_{der}}{RfD}$$

$$HI = HI_{ing} + HI_{der}$$

$$Risk_{ing} = ADD_{ing} \times CSF$$

$$Risk_{der} = ADD_{der} \times CSF$$

$$Risk = Risk_{ing} + Risk_{der}$$

Compound	EPC Soil (mg/kg)	RfD (mg/kg-d)	CSF 1/(mg/kg-d)	Incidental Ingestion RAFosc	ADDing-c mg/kg-d	Risking	RAFosnc	ADDing-nc mg/kg-d	HIing	Dermal Contact RAFdsc	ADDder-c mg/kg-d	Riskder	RAFdsnc	ADDder-nc mg/kg-d	HIder	Total Risk (Soil)	HI (Soil)
Carbon tetrachloride	3.7E-02	0.007	0.13	1	3E-10	4E-11	1	5E-08	7E-06	0.1	3E-10	4E-11	0.1	5E-08	7E-06	8E-11	1E-05
Chloroethane	9.5E-02	0.4	NA	NC	NA	NA	1	1E-07	3E-07	NC	NA	NA	0.1	1E-07	3E-07	NA	6E-07
Chloroform	3.7E-02	0.01	NA	NA	NA	NA	1	5E-08	5E-06	NA	NA	NA	0.1	5E-08	5E-06	NA	9E-06
Dichloroethane,1,1-	4.3E-01	1	NA	NC	NA	NA	1.3	7E-07	7E-07	NC	NA	NA	0.13	7E-07	7E-07	NA	1E-06
Dichloroethene, cis-1,2-	7.7E-01	0.1	NA	NC	NA	NA	1	1E-06	1E-05	NC	NA	NA	0.1	1E-06	1E-05	NA	2E-05
Dichloroethene,1,1-	4.9E-01	0.05	NA	NC	NA	NA	1	6E-07	1E-05	NC	NA	NA	0.1	6E-07	1E-05	NA	2E-05
Tetrachloroethene	5.9E+01	0.1	0.051	1	5E-07	3E-08	1	7E-05	7E-04	0.1	5E-07	3E-08	0.1	7E-05	7E-04	5E-08	1E-03
Trans-1,2-Dichloroethene	3.7E-02	0.2	NA	NC	NA	NA	1	5E-08	2E-07	NC	NA	NA	0.1	5E-08	2E-07	NA	5E-07
Trichloroethane,1,1,1-	7.7E-02	0.9	NA	NC	NA	NA	1	9E-08	1E-07	NC	NA	NA	0.1	1E-07	1E-07	NA	2E-07
Trichloroethene	6.2E+00	0.02	0.011	1	5E-08	6E-10	1	8E-06	4E-04	0.1	5E-08	6E-10	0.1	8E-06	4E-04	1E-09	8E-04
Vinyl chloride	3.7E-02	0.003	1.4	1.53	5E-10	7E-10	1	5E-08	2E-05	0.16	5E-10	7E-10	0.1	5E-08	2E-05	1E-09	3E-05
Total						3E-08			1E-03			3E-08			1E-03	6E-08	2E-03

NA - Not available
NC - Not calculated
ND - Not detected

Table A-5
Exposure and Risk Estimates Associated With Inhalation of Soil-Derived Particulates in Air
50 Tufts Street, Somerville MA
UniFirst
Construction Worker at other streets
Ambient Air

Receptor:	Construction Worker
Medium of Origin:	Soil
Exposure Medium:	Ambient Air
Exposure Area:	Excavation
Depth:	0-15 feet
Duration:	Subchronic

Parameter	Definition	Units	Value	Comment
IRair	Outdoor Air Inhalation Rate - Particulates	m3/hr	4	
IRairTWA	Outdoor Air TWA Inhalation Rate - Particulates	m3-y/h-kg	0	
PEF	Outdoor Air PM10 - Particulates	ug/m3	60	
ET	Outdoor Air Exposure Time - Particulates	hr/d	8	
EF	Outdoor Air Exposure Frequency - Particulates	d/y	130	
EP	Outdoor Air Exposure Period - Cancer - Particulates	y	1	
EP	Outdoor Air Exposure Period - Non-Cancer - Particulates	y	1	
ATc	Outdoor Air Averaging Time - Cancer - Particulates	d	25550	
ATn	Outdoor Air Averaging Time - Non-Cancer - Particulates	d	182	
BW	Body Weight	kg	58	
C	Conversion Factor	ug/mg	1000	

$$C_{air} = C_{soil} \times PM_{10}$$

$$ADD_{inh-gi} = \frac{C_{air} \times 1.5 \times IR_{air} \times RAF_i \times ET \times EF \times EP \times C}{AP \times BW}$$

$$ADD_{inh} = \frac{C_{air} \times 0.5 \times IR_{air} \times RAF_i \times ET \times EF \times EP \times C}{AP \times BW}$$

$$ADE_{inh} = \frac{ADD_{inh} \times 70kg}{20m^3 / d}$$

$$HI = \frac{ADD_{inh-gi}}{RfD} + \frac{ADE_{inh}}{RfC}$$

$$Risk = \left(ADD_{inh-gi} \times CSF\right) + \left(ADE_{inh} \times URF \times C\right)$$

Compound	EPC Soil (mg/kg)	EPC Fugitive Dust (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	RfD (mg/kg-d)	CSF 1/(mg/kg-d)	RAFic	ADD-inhc mg/kg-d	ADE-c mg/m3	Riskinh	ADD-ingc	Risking	RAFinc	ADD-inhnc mg/kg-d	ADE-nc mg/m3	HIinh	ADD-ingnc	HIing	Risk (Particulates in Air) YC-OC-A	HI (Particulates in Air) YC
Carbon tetrachloride	3.7E-02	2.2E-09	0.43	0.000015	0.007	0.13	1	3E-12	1E-11	1E-13	8E-12	1E-12	1	4E-10	1E-09	3E-09	1E-09	2E-07	1E-12	2E-07
Chloroethane	9.5E-02	5.7E-09	10	NA	0.4	NA	NC	NA	NA	NA	NA	NA	1	1E-09	4E-09	4E-10	3E-09	8E-09	NA	8E-09
Chloroform	3.7E-02	2.2E-09	0.66	0.000023	0.01	NA	1	3E-12	1E-11	2E-13	NA	NA	1	4E-10	1E-09	2E-09	1E-09	1E-07	2E-13	1E-07
Dichloroethane,1,1-	4.3E-01	2.6E-08	5	NA	1	NA	NC	NA	NA	NA	NA	NA	1	5E-09	2E-08	3E-09	1E-08	1E-08	NA	2E-08
Dichloroethene, cis-1,2-	7.7E-01	4.6E-08	0.035	NA	0.1	NA	NC	NA	NA	NA	NA	NA	1	8E-09	3E-08	8E-07	2E-08	2E-07	NA	1E-06
Dichloroethene,1,1-	4.9E-01	2.9E-08	0.2	NA	0.05	NA	1	NA	NA	NA	NA	NA	1	5E-09	2E-08	9E-08	2E-08	3E-07	NA	4E-07
Tetrachloroethene	5.9E+01	3.5E-06	4.6	0.00001	0.1	0.051	1	4E-09	2E-08	2E-10	1E-08	7E-10	1	6E-07	2E-06	5E-07	2E-06	2E-05	8E-10	2E-05
Trans-1,2-Dichloroethene	3.7E-02	2.2E-09	0.7	NA	0.2	NA	NC	NA	NA	NA	NA	NA	1	4E-10	1E-09	2E-09	1E-09	6E-09	NA	8E-09
Trichloroethane,1,1,1-	7.7E-02	4.6E-09	5.2	NA	0.9	NA	NC	NA	NA	NA	NA	NA	1	8E-10	3E-09	5E-10	2E-09	3E-09	NA	3E-09
Trichloroethene	6.2E+00	3.7E-07	0.18	0.0000017	0.02	0.011	1	5E-10	2E-09	3E-12	1E-09	2E-11	1	7E-08	2E-07	1E-06	2E-07	1E-05	2E-11	1E-05
Vinyl chloride	3.7E-02	2.2E-09	0.1	0.0000088	0.003	1.4	1	3E-12	1E-11	9E-14	8E-12	1E-11	1	4E-10	1E-09	1E-08	1E-09	4E-07	1E-11	4E-07
Total										2E-10		7E-10				3E-06		3E-05	9E-10	3E-05

NA - Not available
NC - Not calculated
ND - Not detected

Table A-6
Volatilization Factors
50 Tufts Street, Somerville MA
UniFirst
Construction Worker at other streets

Compound	Henry's Law Constant at Avg GW Temp (conc/conc) H'_{TS} (conc/conc)	Deff Vadose Zone (Layer A + Layer B) (cm2/sec)	Deff Total (Layer A + Layer B + Layer C) (cm2/sec)	Deffcrack (Layer A) (cm2/sec)	Exponent of Peclet Number	Organic Carbon-Water Partition Coefficient Koc (cm3/g)	Volatilization from Subsurface Soil to Excavation Air VF (mg/m3) / (mg/kg)	Volatilization from Subsurface Soil to Trench Air VF (mg/m3) / (mg/kg)	Volatilization from Soil Gas to Excavation Air Alpha (mg/m3 excav) / (mg/m3 SG)	Volatilization from Soil Gas to Trench Air Alpha (mg/m3 trench) / (mg/m3 SG)	Volatilization from Groundwater to Excavation Air VF (mg/m3) / (mg/L)	Volatilization from Groundwater to Trench Air VF (mg/m3) / (mg/L)
Carbon tetrachloride	5.88E-01	1.54E-02	1.09E-02	1.54E-02	1.28E+104	1.5E+02	1.53E-03	6.95E-03	9.35E-05	6.13E-06	3.91E-02	2.56E-03
Chloroethane	4.77E-01	5.35E-02	3.80E-02	5.35E-02	9.20E+29	2.4E+01	5.80E-03	2.64E-02	3.25E-04	2.13E-05	1.10E-01	7.21E-03
Chloroform	8.04E-02	2.05E-02	1.46E-02	2.05E-02	1.20E+78	5.3E+01	1.11E-03	5.06E-03	1.25E-04	8.17E-06	7.13E-03	4.67E-04
Dichloroethane,1,1-	1.24E-01	1.46E-02	1.04E-02	1.46E-02	2.74E+109	5.3E+01	1.15E-03	5.25E-03	8.89E-05	5.83E-06	7.86E-03	5.15E-04
Dichloroethene, cis-1,2-	8.79E-02	1.45E-02	1.03E-02	1.45E-02	2.13E+110	3.6E+01	1.17E-03	5.34E-03	8.82E-05	5.78E-06	5.52E-03	3.62E-04
Dichloroethene,1,1-	6.34E-01	1.78E-02	1.26E-02	1.78E-02	1.68E+90	6.5E+01	2.51E-03	1.14E-02	1.08E-04	7.07E-06	4.86E-02	3.18E-03
Tetrachloroethene	3.24E-01	1.42E-02	1.01E-02	1.42E-02	6.04E+112	2.7E+02	8.42E-04	3.83E-03	8.63E-05	5.65E-06	1.99E-02	1.30E-03
Trans-1,2-Dichloroethene	2.13E-01	1.40E-02	9.91E-03	1.40E-02	7.16E+114	3.8E+01	1.71E-03	7.75E-03	8.48E-05	5.55E-06	1.28E-02	8.42E-04
Trichloroethane,1,1,1-	3.66E-01	1.54E-02	1.09E-02	1.54E-02	1.28E+104	1.4E+02	1.29E-03	5.85E-03	9.35E-05	6.13E-06	2.43E-02	1.59E-03
Trichloroethene	1.97E-01	1.56E-02	1.11E-02	1.56E-02	6.13E+102	9.4E+01	1.14E-03	5.18E-03	9.47E-05	6.20E-06	1.33E-02	8.70E-04
Vinyl chloride	7.65E-01	2.09E-02	1.49E-02	2.09E-02	4.04E+76	1.9E+01	4.71E-03	2.14E-02	1.27E-04	8.32E-06	6.91E-02	4.52E-03

Table A-7
Site-specific Parameters for Volatilization Calculations
50 Tufts Street, Somerville MA
UniFirst
Construction Worker at other streets

Symbol	(units)	Parameter	Value	Comment	
L_{crack}	(cm)	Thickness of foundation	15		
foc	(g/g)	Fraction organic carbon in vadose zone soil	0.02		
L_F	(15 or 200 cm)	Depth below grade to bottom of enclosed space floor	15	Input either 15 or 200	
L_{WT}	(cm)	Depth below grade to water table	462	15.16	Ft.
T_S	Kelvin	Average soil/ groundwater temperature	283	10	(°C)
L_T	(cm)	Source- building separation	447		
L_B	(cm)	Length of building	961	DEP Default	
W_B	(cm)	Width of building	961	DEP Default	
H_B	(cm)	Height of building	488	DEP Default	
X_{crack}	(cm)	Floor- wall seam perimeter	3.84E+03		
ER	(1/hr)	Air exchange rate	0.45	DEP Default	
$Q_{building}$	(cm^3/s)	Bldg. ventilation rate	5.63E+04		
A_B	(cm^2)	Area of enclosed space below grade	9.24E+05		
η	(unitless)	Crack- to-total area ratio	4.16E-04		
Z_{crack}	(cm)	Crack depth below grade	15		
μ_{TS}	(g/cm-s)	Vapor viscosity at ave. soil temperature	1.75E-04		
L_d	(cm)	Diffusion path length	447		
L_p	(cm)	Convection path length	15		
r_{crack}	(cm)	Crack radius	0.10	DEP Default	
ΔP	g/cm-s2	Pressure differential between soil surface and enclosed space	40	DEP Default	
Q_{soil}	(cm^3/s)	Average vapor flow rate into bldg.	9.45E+01		
A_{crack}	(cm^2)	Area of crack	384		
Rc	(cal/mol-K)	Gas constant	1.99		
R	(atm-m3/mol-K)	Universal gas constant	8.21E-05		
R2	(mmHg-cm3/mol-K)	Universal gas constant	6.24E+04		
W_{SA}	(cm)	Width of soil source to ambient air	1.52E+03	50	Ft.
t_{SA}	(s)	Averaging time for volatilization from soil to ambient air	1.58E+07	0.5	y
U	(cm/s)	Wind speed	225		
D	(cm)	Mixing height	183	6	Ft.
Z_S	(cm)	Depth to soil source	462	15.16	Ft.
Z_{SG}	(cm)	Depth to soil gas source	462	15.16	Ft.
W_E	(cm)	Width of excavation	1524	50	Ft.
L_E	(cm)	Length of excavation	762	25	Ft.
H_E	(cm)	Height of excavation	457	15	Ft.
W_{Ec}	(cm)	Width of excavation that is contaminated	1524	50	Ft.
L_{Ec}	(cm)	Length of excavation that is contaminated	762	25	Ft.
H_{Ec}	(cm)	Height of excavation that is contaminated	457	15	Ft.
WT	(cm)	Width of trench	457	15	Ft.
LT	(cm)	Length of trench	122	4	Ft.
HT	(cm)	Height of trench	183	6	Ft.
WTc	(cm)	Width of trench that is contaminated	457	15	Ft.
LTc	(cm)	Length of trench that is contaminated	122	4	Ft.
HTc	(cm)	Height of trench that is contaminated	183	6	Ft.
t_{SE}	(s)	Averaging time for volatilization from soil to excavation	1.58E+07	0.5	y
t_{ST}	(s)	Averaging time for volatilization from soil to trench	3.15E+07	1	y
F_E	(unitless)	Fraction of wind speed that occurs in excavation	0.5		
F_T	(unitless)	Fraction of wind speed that occurs in trench	0.1		
d	(cm)	Lower depth of surface soil source	462	15.16	Ft.
			Vadose Zone Layer A	Vadose Zone Layer B	Capillary Zone
ρ_b	(g/cm^3)	Vadose zone soil dry bulk density	1.5	1.5	1.5
n	(unitless)	Vadose zone soil total porosity	0.43	0.43	0.43
θ_w	(cm^3/cm^3)	Vadose zone soil water-filled porosity	0.06	0.06	0.25
θ_a	(cm^3/cm^3)	Vadose zone soil air-filled porosity	0.37	0.37	0.18
h	(cm)	Thickness of soil layer	15	415	17
S_{te}	(cm^3/cm^3)	Vadose zone effective total fluid saturation			0.019
k_i	(cm^2)	Vadose zone soil intrinsic permeability			9.92E-08
k_{rg}	(cm^2)	Vadose zone soil relative air permeability			0.99
k_v	(cm^2)	Vadose zone soil effective vapor permeability			9.79E-08

Select soil type in vadose zone and capillary zone:

Vadose zone adjacent to building	Sand ▾
Capillary zone	Sand ▾

Key:

Type in Site-specific values here
Calculated values
Constants
Default parameter values from DEP

Values Assume all sources are 1 inch below excavation depth

Table A-8
Exposure and Risk Estimates Associated With Inhalation of Volatile Compounds in Air
50 Tufts Street, Somerville MA
UniFirst
Construction Worker at other streets
Excavation Air
Volatilization from Soil Gas

Receptor:	Construction Worker
Medium of Origin:	Soil Gas
Exposure Medium:	Excavation Air
Exposure Area:	Excavation
Depth:	0-15 feet
Duration:	Subchronic

$$C_{air} = \frac{C_{source} \times (VF\ or\ alpha)}{SDF}$$

$$ADE_{inh} = \frac{C_{air} \times RAF_i \times ET \times EF \times EP}{24\,hr/d \times 365\,d/y \times AT}$$

$$HI_{inh} = \frac{ADE_{inh}}{RfC}$$

$$Risk = ADE_{inh} \times URF \times C$$

Parameter	Definition	Units	Value	Comment
ET	Outdoor Air Exposure Time - Volatiles	hr/d	8	
EF	Outdoor Air Exposure Frequency - Volatiles	d/y	130	
EP	Outdoor Air Exposure Period - Non-Cancer - Volatiles	y	1	
EP	Outdoor Air Exposure Period - Cancer - Volatiles	y	1	
ATc	Outdoor Air Averaging Time - Cancer - Volatiles	d	25550	
ATn	Outdoor Air Averaging Time - Non-Cancer - Volatiles	d	182	
C	Conversion Factor	ug/mg	1000	

Compound	EPC Soil Gas mg/m3	Alpha Volatilization from Soil Gas to Excavation Air (mg/m3 excav) / (mg/m3 SG)	Source Dilution Factor	EPC Excavation Air (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	RAFic	ADE-c mg/m3	Riskinh	RAFinc	ADE-nc mg/m3	HIinh	Risk (Trench Air)	HI (Trench Air)
Carbon tetrachloride	8.7E-01	9.35E-05	1	8.1E-05	0.43	0.000015	1	1E-07	2E-09	1	1E-05	2E-05	2E-09	2E-05
Chloroethane	3.6E-01	3.25E-04	1	1.2E-04	10	NA	NC	NA	NA	1	1E-05	1E-06	NA	1E-06
Chloroform	NA	1.25E-04	1	NA	0.66	0.000023	1	NA	NA	1	NA	NA	NA	NA
Dichloroethane,1,1-	1.0E+00	8.89E-05	1	9.2E-05	5	NA	NC	NA	NA	1	1E-05	2E-06	NA	2E-06
Dichloroethene, cis-1,2-	1.7E+00	8.82E-05	1	1.5E-04	0.035	NA	NC	NA	NA	1	2E-05	5E-04	NA	5E-04
Dichloroethene,1,1-	1.3E+00	1.08E-04	1	1.4E-04	0.2	NA	1	NA	NA	1	2E-05	8E-05	NA	8E-05
Tetrachloroethene	3.3E+02	8.63E-05	1	2.9E-02	4.6	0.00001	1	5E-05	5E-07	1	3E-03	7E-04	5E-07	7E-04
Trans-1,2-Dichloroethene	5.5E-01	8.48E-05	1	4.6E-05	0.7	NA	NC	NA	NA	1	5E-06	8E-06	NA	8E-06
Trichloroethane,1,1,1-	3.7E+00	9.35E-05	1	3.4E-04	5.2	NA	NC	NA	NA	1	4E-05	8E-06	NA	8E-06
Trichloroethene	2.8E+00	9.47E-05	1	2.7E-04	0.18	0.0000017	1	5E-07	8E-10	1	3E-05	2E-04	8E-10	2E-04
Vinyl chloride	3.5E-01	1.27E-04	1	4.5E-05	0.1	0.0000088	1	8E-08	7E-10	1	5E-06	5E-05	7E-10	5E-05
Total									5E-07			2E-03	5E-07	2E-03

NA - Not available
NC - Not calculated
ND - Not detected

Table A-9
Exposure and Risk Estimates Associated With Inhalation of Volatile Compounds in Air
50 Tufts Street, Somerville MA
UniFirst
Construction Worker at other streets
Excavation Air
Volatilization from Subsurface Soil

Receptor:	Construction Worker
Medium of Origin:	Subsurface Soil
Exposure Medium:	Excavation Air
Exposure Area:	Excavation
Depth:	0-15 feet
Duration:	Subchronic

$$C_{air} = \frac{C_{source} \times (VF \ or \ alpha)}{SDF}$$

$$ADE_{inh} = \frac{C_{air} \times RAF_i \times ET \times EF \times EP}{24\,hr/d \times 365\,d/y \times AT}$$

$$HI_{inh} = \frac{ADE_{inh}}{RfC}$$

$$Risk = ADE_{inh} \times URF \times C$$

Parameter	Definition	Units	Value	Comment
ET	Outdoor Air Exposure Time - Volatiles	hr/d	8	
EF	Outdoor Air Exposure Frequency - Volatiles	d/y	130	
EP	Outdoor Air Exposure Period - Non-Cancer - Volatiles	y	1	
EP	Outdoor Air Exposure Period - Cancer - Volatiles	y	1	
ATc	Outdoor Air Averaging Time - Cancer - Volatiles	d	25550	
ATn	Outdoor Air Averaging Time - Non-Cancer - Volatiles	d	182	
C	Conversion Factor	ug/mg	1000	

Compound	EPC Subsurface Soil mg/kg	VF Volatilization from Subsurface Soil to Excavation Air (mg/m3) / (mg/kg)	Source Dilution Facto	EPC Excavation Air (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	RAFic	ADE-c mg/m3	Riskinh	RAFinc	ADE-nc mg/m3	HIinh	Risk (Excavation Air)	HI (Excavation Air)
Carbon tetrachloride	3.7E-02	1.53E-03	1	5.7E-05	0.43	0.000015	1	1E-07	1E-09	1	7E-06	2E-05	1E-09	2E-05
Chloroethane	9.5E-02	5.80E-03	1	5.5E-04	10	NA	NC	NA	NA	1	7E-05	7E-06	NA	7E-06
Chloroform	3.7E-02	1.11E-03	1	4.1E-05	0.66	0.000023	1	7E-08	2E-09	1	5E-06	7E-06	2E-09	7E-06
Dichloroethane,1,1-	4.3E-01	1.15E-03	1	5.0E-04	5	NA	NC	NA	NA	1	6E-05	1E-05	NA	1E-05
Dichloroethene, cis-1,2-	7.7E-01	1.17E-03	1	9.1E-04	0.035	NA	NC	NA	NA	1	1E-04	3E-03	NA	3E-03
Dichloroethene,1,1-	4.9E-01	2.51E-03	1	1.2E-03	0.2	NA	1	NA	NA	1	1E-04	7E-04	NA	7E-04
Tetrachloroethene	5.9E+01	8.42E-04	1	5.0E-02	4.6	0.00001	1	8E-05	8E-07	1	6E-03	1E-03	8E-07	1E-03
Trans-1,2-Dichloroethene	3.7E-02	1.71E-03	1	6.3E-05	0.7	NA	NC	NA	NA	1	7E-06	1E-05	NA	1E-05
Trichloroethane,1,1,1-	7.7E-02	1.29E-03	1	9.9E-05	5.2	NA	NC	NA	NA	1	1E-05	2E-06	NA	2E-06
Trichloroethene	6.2E+00	1.14E-03	1	7.0E-03	0.18	0.0000017	1	1E-05	2E-08	1	8E-04	5E-03	2E-08	5E-03
Vinyl chloride	3.7E-02	4.71E-03	1	1.7E-04	0.1	0.0000088	1	3E-07	3E-09	1	2E-05	2E-04	3E-09	2E-04
Total									9E-07			1E-02	9E-07	1E-02

NA - Not available
NC - Not calculated
ND - Not detected

Table A-10
Exposure and Risk Estimates Associated With Inhalation of Volatile Compounds in Air
50 Tufts Street, Somerville MA
UniFirst
Construction Worker at other streets
Excavation Air
Volatilization from Groundwater

Receptor:	Construction Worker ▼
Medium of Origin:	Groundwater ▼
Exposure Medium:	Excavation Air ▼
Exposure Area:	Excavation ▼
Depth:	0-15 feet ▼
Duration:	Subchronic ▼

$$C_{air} = \frac{C_{source} \times (VF \ or \ alpha)}{SDF}$$

$$ADE_{inh} = \frac{C_{air} \times RAF_i \times ET \times EF \times EP}{24 hr/d \times 365 d/y \times AT}$$

$$HI_{inh} = \frac{ADE_{inh}}{RfC}$$

$$Risk = ADE_{inh} \times URF \times C$$

Parameter	Definition	Units	Value	Comment
ET	Outdoor Air Exposure Time - Volatiles	hr/d	8	
EF	Outdoor Air Exposure Frequency - Volatiles	d/y	130	
EP	Outdoor Air Exposure Period - Non-Cancer - Volatiles	y	1	
EP	Outdoor Air Exposure Period - Cancer - Volatiles	y	1	
ATc	Outdoor Air Averaging Time - Cancer - Volatiles	d	25550	
ATn	Outdoor Air Averaging Time - Non-Cancer - Volatiles	d	182	
C	Conversion Factor	ug/mg	1000	

	EPC	VF		EPC										
	Groundwater	Volatilization from Groundwater to Excavation Air (mg/m3) / (mg/L)	Source Dilution Factor	Excavation Air	RfC	URF	RAFic	ADE-c	Riskinh	RAFinc	ADE-nc	HIinh	Risk (Trench Air)	HI (Trench Air)
Compound	(mg/L)			(mg/m3)	(mg/m3)	1/(ug/m3)		mg/m3			mg/m3			
Carbon tetrachloride	5.0E-04	3.91E-02	1	2.0E-05	0.43	0.000015	1	3E-08	5E-10	1	2E-06	5E-06	5E-10	5E-06
Chloroethane	1.5E-02	1.10E-01	1	1.6E-03	10	NA	NC	NA	NA	1	2E-04	2E-05	NA	2E-05
Chloroform	8.9E-03	7.13E-03	1	6.4E-05	0.66	0.000023	1	1E-07	2E-09	1	8E-06	1E-05	2E-09	1E-05
Dichloroethane,1,1-	7.7E-02	7.86E-03	1	6.0E-04	5	NA	NC	NA	NA	1	7E-05	1E-05	NA	1E-05
Dichloroethene, cis-1,2-	2.0E-01	5.52E-03	1	1.1E-03	0.035	NA	NC	NA	NA	1	1E-04	4E-03	NA	4E-03
Dichloroethene,1,1-	4.3E-02	4.86E-02	1	2.1E-03	0.2	NA	1	NA	NA	1	2E-04	1E-03	NA	1E-03
Tetrachloroethene	6.7E+00	1.99E-02	1	1.3E-01	4.6	0.00001	1	2E-04	2E-06	1	2E-02	3E-03	2E-06	3E-03
Trans-1,2-Dichloroethene	7.6E-03	1.28E-02	1	9.7E-05	0.7	NA	NC	NA	NA	1	1E-05	2E-05	NA	2E-05
Trichloroethane,1,1,1-	9.1E-02	2.43E-02	1	2.2E-03	5.2	NA	NC	NA	NA	1	3E-04	5E-05	NA	5E-05
Trichloroethene	1.5E-01	1.33E-02	1	2.0E-03	0.18	0.0000017	1	3E-06	6E-09	1	2E-04	1E-03	6E-09	1E-03
Vinyl chloride	5.8E-02	6.91E-02	1	4.0E-03	0.1	0.0000088	1	7E-06	6E-08	1	5E-04	5E-03	6E-08	5E-03
Total									2E-06			1E-02	2E-06	1E-02

NA - Not available
NC - Not calculated
ND - Not detected

Table A-11
Exposure and Risk Estimates Associated With Inhalation of Volatile Compounds in Air
50 Tufts Street, Somerville MA
UniFirst
Construction Worker at other streets
Excavation Air

Receptor:	Construction Worker	
Medium of Origin:		All 3 media
Exposure Medium:	Excavation Air	
Exposure Area:	Excavation	
Depth:	0-15 feet	
Duration:	Subchronic	

$$C_{air} = \frac{C_{source} \times (VF \text{ or } alpha)}{SDF}$$

$$ADE_{inh} = \frac{C_{air} \times RAF_i \times ET \times EF \times EP}{24\,hr/d \times 365\,d/y \times AT}$$

$$HI_{inh} = \frac{ADE_{inh}}{RfC}$$

$$Risk = ADE_{inh} \times URF \times C$$

Parameter	Definition	Units	Value	Comment
ET	Outdoor Air Exposure Time - Volatiles	hr/d	8	
EF	Outdoor Air Exposure Frequency - Volatiles	d/y	130	
EP	Outdoor Air Exposure Period - Non-Cancer - Volatiles	y	1	
EP	Outdoor Air Exposure Period - Cancer - Volatiles	y	1	
ATc	Outdoor Air Averaging Time - Cancer - Volatiles	d	25550	
ATn	Outdoor Air Averaging Time - Non-Cancer - Volatiles	d	182	
C	Conversion Factor	ug/mg	1000	

Compound	EPC Average of 3 media (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	RAFic	ADE-c mg/m3	Riskinh	RAFinc	ADE-nc mg/m3	HIinh	Risk (Trench Air)	HI (Trench Air)
Carbon tetrachloride	5.2E-05	0.43	0.000015	1	9E-08	1E-09	1	6E-06	1E-05	1E-09	1E-05
Chloroethane	7.7E-04	10	NA	NC	NA	NA	1	9E-05	9E-06	NA	9E-06
Chloroform	5.2E-05	0.66	0.000023	1	9E-08	2E-09	1	6E-06	9E-06	2E-09	9E-06
Dichloroethane,1,1-	4.0E-04	5	NA	NC	NA	NA	1	5E-05	9E-06	NA	9E-06
Dichloroethene, cis-1,2-	7.2E-04	0.035	NA	NC	NA	NA	1	9E-05	2E-03	NA	2E-03
Dichloroethene,1,1-	1.2E-03	0.2	NA	1	NA	NA	1	1E-04	7E-04	NA	7E-04
Tetrachloroethene	7.0E-02	4.6	0.00001	1	1E-04	1E-06	1	8E-03	2E-03	1E-06	2E-03
Trans-1,2-Dichloroethene	6.9E-05	0.7	NA	NC	NA	NA	1	8E-06	1E-05	NA	1E-05
Trichloroethane,1,1,1-	8.8E-04	5.2	NA	NC	NA	NA	1	1E-04	2E-05	NA	2E-05
Trichloroethene	3.1E-03	0.18	0.0000017	1	5E-06	9E-09	1	4E-04	2E-03	9E-09	2E-03
Vinyl chloride	1.4E-03	0.1	0.0000088	1	2E-06	2E-08	1	2E-04	2E-03	2E-08	2E-03
Total						1E-06			9E-03	1E-06	9E-03

NA - Not available
NC - Not calculated
ND - Not detected
Assumes groundwater is directly beneath the excavation

Table A-12
Exposure and Risk Estimates Associated With Soil Contact
50 Tufts Street, Somerville MA
UniFirst
Future Resident at other streets
Soil

Receptor:	Resident ▼
Medium:	Soil ▼
Exposure Area:	Future ▼
Depth:	0-15 feet ▼
Duration:	Chronic ▼

Parameter	Definition	Units	Value	Comment
IRsoil	Soil Ingestion Rate	mg/d	100	
IRsoilTWA	Soil TWA Ingestion Rate	mg-y/kg-d	64	
SA	Soil Dermal Contact Skin Exposed	cm2/d	2431	
SATWA	Soil TWA Dermal Contact Skin Exposed	mg-cm2-y/kg-d-cm2	659	
AF	Soil Dermal Contact Adherence Rate	mg/cm2	0.35	
EF	Soil Exposure Frequency	d/y	150	
EPc	Soil Exposure Period - Cancer	y	30	
EPnc	Soil Exposure Period - Non-Cancer	y	7	
ATc	Soil Averaging Time - Cancer	d	25550	
ATn	Soil Averaging Time - Non-Cancer	d	2555	
BW	Body Weight	kg	17	
CF	Conversion Factor	kg/mg	0.000001	

$$ADD_{ing} = \frac{C_{soil} \times CF \times IR_{soil} \times RAF_{os} \times EF \times EP}{AP \times BW}$$

$$ADD_{der-nc} = \frac{C_{soil} \times CF \times SA \times AF \times RAF_{ds} \times EF \times EP}{AP \times BW}$$

$$ADD_{ing-c} = \frac{C_{soil} \times CF \times IR_{soil}TWA \times RAF_{os} \times EF}{AP}$$

$$ADD_{der-c} = \frac{C_{soil} \times CF \times SATWA \times RAF_{ds} \times EF}{AP}$$

$$HI_{ing} = \frac{ADD_{ing-nc}}{RfD}$$

$$HI_{der} = \frac{ADD_{der-nc}}{RfD}$$

$$HI = HI_{ing} + HI_{der}$$

$$Risk_{ing} = ADD_{ing-c} \times CS$$

$$Risk_{der} = ADD_{der-c} \times CSF$$

$$Risk = Risk_{ing} + Risk_{der}$$

Compound	EPC Soil (mg/kg)	RfD (mg/kg-d)	CSF 1/(mg/kg-d)	Incidental Ingestion RAFosc	ADDing-c mg/kg-d	Risking	RAFosnc	ADDing-nc mg/kg-d	HIing	Dermal Contact RAFdsc	ADDder-c mg/kg-d	Riskder	RAFdsnc	ADDder-nc mg/kg-d	HIder	Total Risk (Soil) YC-OC-A	HI (Soil) YC
Carbon tetrachloride	3.7E-02	0.0007	0.13	1	1E-08	2E-09	1	9E-08	1E-04	0.1	1E-08	2E-09	0.1	8E-08	1E-04	4E-09	2E-04
Chloroform	3.7E-02	0.01	NA	NA	NA	NA	1	9E-08	9E-06	NA	NA	NA	0.1	8E-08	8E-06	NA	2E-05
Dichloroethane,1,1-	4.3E-01	0.1	NA	NC	NA	NA	1.3	1E-06	1E-05	NC	NA	NA	0.13	1E-06	1E-05	NA	3E-05
Dichloroethene, cis-1,2-	7.7E-01	0.01	NA	NC	NA	NA	1	2E-06	2E-04	NC	NA	NA	0.1	2E-06	2E-04	NA	3E-04
Dichloroethene,1,1-	4.9E-01	0.05	NA	NC	NA	NA	1	1E-06	2E-05	NC	NA	NA	0.1	1E-06	2E-05	NA	4E-05
Tetrachloroethene	5.9E+01	0.01	0.051	1	2E-05	1E-06	1	1E-04	1E-02	0.1	2E-05	1E-06	0.1	1E-04	1E-02	2E-06	3E-02
Trans-1,2-Dichloroethene	3.7E-02	0.02	NA	NC	NA	NA	1	9E-08	4E-06	NC	NA	NA	0.1	8E-08	4E-06	NA	8E-06
Trichloroethane,1,1,1-	7.7E-02	0.09	NA	NC	NA	NA	1	2E-07	2E-06	NC	NA	NA	0.1	2E-07	2E-06	NA	4E-06
Trichloroethene	6.2E+00	0.002	0.011	1	2E-06	3E-08	1	1E-05	7E-03	0.1	2E-06	3E-08	0.1	1E-05	6E-03	5E-08	1E-02
Vinyl chloride	3.7E-02	0.003	1.4	1.53	2E-08	3E-08	1	9E-08	3E-05	0.16	2E-08	3E-08	0.1	8E-08	3E-05	6E-08	6E-05
Total						1E-06			2E-02			1E-06			2E-02	2E-06	4E-02

NA - Not available
NC - Not calculated
ND - Not detected

Table A-13
Exposure and Risk Estimates Associated With Inhalation of Soil-Derived Particulates in Air
50 Tufts Street, Somerville MA
UniFirst
Future Resident at other streets
Ambient Air

Receptor:	Resident ▼
Medium of Origin:	Soil ▼
Exposure Medium:	Ambient Air ▼
Exposure Area:	Future ▼
Depth:	0-15 feet ▼
Duration:	Chronic ▼

Parameter	Definition	Units	Value	Comment
IRair	Outdoor Air Inhalation Rate - Particulates	m3/hr	0.4	
IRairTWA	Outdoor Air TWA Inhalation Rate - Particulates	m3-y/h-kg	0.6	
PEF	Outdoor Air PM10 - Particulates	ug/m3	32	
ET	Outdoor Air Exposure Time - Particulates	hr/d	8	
EF	Outdoor Air Exposure Frequency - Particulates	d/y	150	
EP	Outdoor Air Exposure Period - Cancer - Particulates	y	30	
EP	Outdoor Air Exposure Period - Non-Cancer - Particulates	y	7	
ATc	Outdoor Air Averaging Time - Cancer - Particulates	d	25550	
ATn	Outdoor Air Averaging Time - Non-Cancer - Particulates	d	2555	
BW	Body Weight	kg	17	
C	Conversion Factor	ug/mg	1000	

$$C_{air} = C_{soil} \times PM_{10}$$

$$ADD_{inh-gi-c} = \frac{C_{air} \times 1.5 \times IR_{air} \times RAF_{ic} \times ET \times EF \times EP \times C}{AP \times BW}$$

$$ADD_{inh-gi-nc} = \frac{C_{air} \times 1.5 \times IR_{air} TWA \times RAF_{inc} \times ET \times EF \times C}{AP}$$

$$ADD_{inh-c} = \frac{C_{air} \times 0.5 \times IR_{air} \times RAF_{ic} \times ET \times EF \times EP \times C}{AP \times BW}$$

$$ADD_{inh-nc} = \frac{C_{air} \times 0.5 \times IR_{air} TWA \times RAF_{inc} \times ET \times EF \times C}{AP}$$

$$ADE_{inh} = \frac{ADD_{inh} \times 70kg}{20m^3 / d}$$

$$HI = \frac{ADD_{inh-gi-nc}}{RfD} + \frac{ADE_{inh-nc}}{RfC}$$

$$Risk = \left(ADD_{inh-gi-c} \times CSF\right) + \left(ADE_{inh-c} \times URF \times C\right)$$

Compound	EPC Soil (mg/kg)	EPC Fugitive Dust (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	RfD (mg/kg-d)	CSF 1/(mg/kg-d)	RAFic	ADD-inhc mg/kg-d	ADE-c mg/m3	Riskinh	ADD-ingc	Risking	RAFinc	ADD-inhnc mg/kg-d	ADE-nc mg/m3	HIinh	ADD-ingnc	HIing	Risk (Particulates in Air) YC-OC-A	HI (Particulates in Air) YC
Carbon tetrachloride	3.7E-02	1.2E-09	0.43	0.000015	0.0007	0.13	1	2E-11	6E-11	9E-13	7E-11	9E-12	1	4E-11	1E-10	3E-10	1E-10	2E-07	1E-11	2E-07
Chloroform	3.7E-02	1.2E-09	0.66	0.000023	0.01	NA	1	2E-11	6E-11	1E-12	NA	NA	1	4E-11	1E-10	2E-10	1E-10	1E-08	1E-12	1E-08
Dichloroethane,1,1-	4.3E-01	1.4E-08	0.5	NA	0.1	NA	NC	NA	NA	NA	NA	NA	1	5E-10	2E-09	3E-09	1E-09	1E-08	NA	2E-08
Dichloroethene, cis-1,2-	7.7E-01	2.5E-08	0.035	NA	0.01	NA	NC	NA	NA	NA	NA	NA	1	9E-10	3E-09	9E-08	3E-09	3E-07	NA	3E-07
Dichloroethene,1,1-	4.9E-01	1.6E-08	0.2	NA	0.05	NA	1	NA	NA	NA	NA	NA	1	5E-10	2E-09	1E-08	2E-09	3E-08	NA	4E-08
Tetrachloroethene	5.9E+01	1.9E-06	4.6	0.00001	0.01	0.051	1	3E-08	9E-08	9E-10	1E-07	5E-09	1	7E-08	2E-07	5E-08	2E-07	2E-05	6E-09	2E-05
Trans-1,2-Dichloroethene	3.7E-02	1.2E-09	0.07	NA	0.02	NA	NC	NA	NA	NA	NA	NA	1	4E-11	1E-10	2E-09	1E-10	6E-09	NA	8E-09
Trichloroethane,1,1,1-	7.7E-02	2.5E-09	5.2	NA	0.09	NA	NC	NA	NA	NA	NA	NA	1	9E-11	3E-10	6E-11	3E-10	3E-09	NA	3E-09
Trichloroethene	6.2E+00	2.0E-07	0.18	0.0000017	0.002	0.011	1	3E-09	1E-08	2E-11	1E-08	1E-10	1	7E-09	2E-08	1E-07	2E-08	1E-05	1E-10	1E-05
Vinyl chloride	3.7E-02	1.2E-09	0.1	0.0000088	0.003	1.4	1	2E-11	6E-11	5E-13	7E-11	9E-11	1	4E-11	1E-10	1E-09	1E-10	4E-08	9E-11	4E-08
Total										9E-10		6E-09				3E-07		3E-05	7E-09	3E-05

NA - Not available
NC - Not calculated
ND - Not detected

Table A-14
Exposure and Risk Estimates Associated With Inhalation of Volatile Compounds in Air
50 Tufts Street, Somerville MA
UniFirst
Future Resident at other streets
Ambient Air

Receptor:	Resident
Medium of Origin:	Ambient Air
Exposure Medium:	Ambient Air
Exposure Area:	Future
Depth:	Shallow
Duration:	Chronic

$$C_{air} = \frac{C_{source} \times VF}{SDF}$$

$$ADE_{inh} = \frac{C_{air} \times RAF_i \times ET \times EF \times EP}{24 hr / d \times 365 d / y \times AT}$$

$$HI_{inh} = \frac{ADE_{inh}}{RfC}$$

$$Risk = ADE_{inh} \times URF \times C$$

Parameter	Definition	Units	Value	Comment
ET	Outdoor Air Exposure Time - Volatiles	hr/d	8	
EF	Outdoor Air Exposure Frequency - Volatiles	d/y	150	
EP	Outdoor Air Exposure Period - Non-Cancer - Volatiles	y	7	
EP	Outdoor Air Exposure Period - Cancer - Volatiles	y	30	
ATc	Outdoor Air Averaging Time - Cancer - Volatiles	d	25550	
ATn	Outdoor Air Averaging Time - Non-Cancer - Volatiles	d	2555	
C	Conversion Factor	ug/mg	1000	

Compound	Outdoor Air Data Ambient Air (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	RAFic	ADE-c mg/m3	Riskinh	RAFinc	ADE-nc mg/m3	HIinh	Risk (Ambient Air)	HI (Ambient Air)
Carbon tetrachloride	NA	0.43	0.000015	1	NA	NA	1	NA	NA	NA	NA
Chloroform	NA	0.66	0.000023	1	NA	NA	1	NA	NA	NA	NA
Dichloroethane,1,1-	NA	0.5	NA	NC	NA	NA	1	NA	NA	NA	NA
Dichloroethene, cis-1,2-	4.6E-04	0.035	NA	NC	NA	NA	1	6E-05	2E-03	NA	2E-03
Dichloroethene,1,1-	4.6E-04	0.2	NA	1	NA	NA	1	6E-05	3E-04	NA	3E-04
Tetrachloroethene	8.2E-04	4.6	0.00001	1	5E-05	5E-07	1	1E-04	2E-05	5E-07	2E-05
Trans-1,2-Dichloroethene	4.6E-04	0.07	NA	NC	NA	NA	1	6E-05	9E-04	NA	9E-04
Trichloroethane,1,1,1-	6.4E-04	5.2	NA	NC	NA	NA	1	9E-05	2E-05	NA	2E-05
Trichloroethene	6.4E-04	0.18	0.0000017	1	4E-05	6E-08	1	9E-05	5E-04	6E-08	5E-04
Vinyl chloride	3.0E-04	0.1	0.0000088	1	2E-05	2E-07	1	4E-05	4E-04	2E-07	4E-04
Total						7E-07			4E-03	7E-07	4E-03

NA - Not available
NC - Not calculated
ND - Not detected

Table A-15
Exposure and Risk Estimates Associated With Inhalation of Volatile Compounds in Air
50 Tufts Street, Somerville MA
UniFirst
Current/Future Resident at other streets
Indoor Air
12 Morton Street

Receptor:	Resident ▼
Medium of Origin:	Indoor Air ▼
Exposure Medium:	Indoor Air ▼
Exposure Area:	12 Morton Street ▼
Depth:	▼
Duration:	Chronic ▼

$$ADE_{inh} = \frac{C_{air} \times RAF_i \times ET \times EF \times EP \times CF1}{24hr/d \times 365d/y \times AT}$$

$$HI_{inh} = \frac{ADE_{inh}}{RfC}$$

$$Risk = ADE_{inh} \times URF \times C2$$

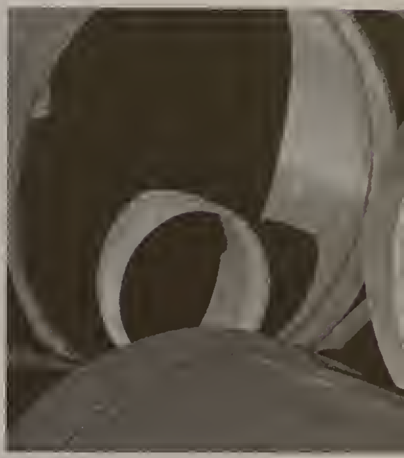
Parameter	Definition	Units	Value	Comment
ET	Indoor Air Exposure Time	h/d	24	
EF	Indoor Air Exposure Frequency	d/y	365	
EP	Indoor Air Exposure Period - Cancer	y	30	
EP	Indoor Air Exposure Period - Non-Cancer	y	7	
ATc	Indoor Air Averaging Time - Cancer	d	25550	
ATn	Indoor Air Averaging Time - Non-Cancer	d	2555	
C1	Conversion Factor	d/y	365	
C2	Conversion Factor	ug/mg	1000	

Compound	EPC Indoor Air (mg/m3)	RfC (mg/m3)	URF 1/(ug/m3)	RAFic	ADE-c mg/m3	Riskinh	RAFinc	ADE-nc mg/m3	HIinh	Risk (Indoor Air)	HI (Indoor Air)
Carbon tetrachloride	NA	0.43	0.000015	1	NA	NA	1	NA	NA	NA	NA
Chloroethane	NA	10	NA	NC	NA	NA	1	NA	NA	NA	NA
Chloroform	NA	0.66	0.000023	1	NA	NA	1	NA	NA	NA	NA
Dichloroethane,1,1-	4.1E-04	0.5	NA	NC	NA	NA	1	4E-04	8E-04	NA	8E-04
Dichloroethene, cis-1,2-	4.0E-04	0.035	NA	NC	NA	NA	1	4E-04	1E-02	NA	1E-02
Dichloroethene,1,1-	4.0E-04	0.2	NA	1	NA	NA	1	4E-04	2E-03	NA	2E-03
Tetrachloroethene	7.2E-04	4.6	0.00001	1	3E-04	3E-06	1	7E-04	2E-04	3E-06	2E-04
Trans-1,2-Dichloroethene	4.0E-04	0.07	NA	NC	NA	NA	1	4E-04	6E-03	NA	6E-03
Trichloroethane,1,1,1-	5.5E-04	5.2	NA	NC	NA	NA	1	6E-04	1E-04	NA	1E-04
Trichloroethene	5.5E-04	0.18	1.7E-06	1	2E-04	4E-07	1	6E-04	3E-03	4E-07	3E-03
Vinyl chloride	2.6E-04	0.1	8.8E-06	1	1E-04	1E-06	1	3E-04	3E-03	1E-06	3E-03
Total						4E-06			3E-02	4E-06	3E-02

NA - Not available
NC - Not calculated
ND - Not detected

GEI Consultants

Geotechnical
Environmental
Water Resources
Ecological



Appendix D

Activity and Use Limitation

GEI Consultants

Geotechnical
Environmental
Water Resources
Ecological

November 19, 2009
Project 04516-3

Department of Environmental Protection
Northeast Regional Office
Bureau of Waste Site Cleanup
205B Lowell Street
Wilmington, MA 01887

RECEIVED
NOV 19 2009
DEP
NORTHEAST REGIONAL OFFICE

Dear Sir or Madam:

Re: **Notice of Activity and Use Limitation (AUL)**
50 Tufts Street
Somerville, Massachusetts
RTN 3-23246

On behalf of our client, UniFirst Corporation, GEI is submitting the enclosed Notice of Activity and Use Limitation (AUL) and supporting documentation for the property located at 12 Morton Street in Somerville, Massachusetts, which is a portion of the 50 Tufts Street disposal site.

The AUL was recorded with the Middlesex South District Registry of Deeds (the Registry) on October 23, 2009. The following information is included:

- Appendix A: AUL Transmittal Form (BWSC113)
- Appendix B: Certified Registry copy of the AUL
- Appendix C: Registry copy of the survey plan referenced in the AUL
- Appendix D: Registry copy of the Trustee's Certificate evidencing signatory authority of the person signing the AUL
- Appendix E: Copies of notification letters sent by certified mail to record interest holders
- Appendix F: Copies of notification letters to be sent to the Chief Municipal Officer, Board of Health, Zoning Board of Appeals, and Inspectional Services

A legal notice of the AUL will be published in the *Somerville Journal* before November 22, 2009, and a copy of the published notice will be submitted to your office within seven days of publication.

If you have any questions, please contact me at 781-721-4000 or igladstone@geiconsultants.com.

Sincerely,

GEI CONSULTANTS, INC.

Ileen S. Gladstone, P.E., LSP
Vice President

JDR/ISG:csh
Enclosures

c: John R. Badey, UniFirst
Vithal V. Deshpande, City of Somerville
Irene M. Dale, Massachusetts Department of Environmental Protection

Appendix A

AUL Transmittal Form
BWSC113

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC113

ACTIVITY & USE LIMITATION (AUL) TRANSMITTAL FORM

Pursuant to 310 CMR 40.1056 & 40.1070 - 40.1084 (Subpart J)

Release Tracking Number
3 - 23246

A. DISPOSAL SITE LOCATION:

1. Disposal Site Name: 50 TUFTS ST & PROP ACROSS THE ST

2. Street Address: 50 TUFTS ST

3. City/Town: SOMERVILLE   4. ZIP Code: 02145-4129

☑ 5. Check here if a Tier Classification Submittal has been provided to DEP for this disposal site.
☐ a. Tier 1A   ☐ b. Tier 1B   ☑ c. Tier 1C   ☐ d. Tier 2

6. If a Tier I Permit has been issued, provide Permit Number: W085813

B. THIS FORM IS BEING USED TO: (check one)

☑ 1. Submit a certified copy of a **Notice of Activity and Use Limitation**, pursuant to 310 CMR 40.1074.

☐ 2. Submit an **Evaluation of Changes in Land Uses/Activities and/or Site Conditions after a Response Action Outcome Statement** has been filed pursuant to 310 CMR 40.1080.

☐ 3. Submit a certified copy of an **Amended Notice of Activity and Use Limitation**, pursuant to 310 CMR 40.1081

☐ 4. Submit a certified copy of a **Partial Termination of a Notice of Activity and Use Limitation**, pursuant to 310 CMR 40.1083(3).

☐ 5. Submit a certified copy of a **Termination of a Notice of Activity and Use Limitation**, pursuant to 310 CMR 40.1083(1)(d).

☐ 6. Submit a certified copy of a **Grant of Environmental Restriction**, pursuant to 310 CMR 40.1071.

☐ 7. Submit a certified copy of an **Amendment of a Grant of Environmental Restriction**, pursuant to 310 CMR 40.1081(3).

☐ 8. Submit a certified copy of a **Partial Release of a Grant of Environmental Restriction**, pursuant to 310 CMR 40.1083(2).

☐ 9. Submit a certified copy of a **Release of a Grant of Environmental Restriction**, pursuant to 310 CMR 40.1083(1)(c).

☐ 10. Submit a certified copy of a **Confirmatory Activity and Use Limitation**, pursuant to 310 CMR 40.1085(4).

11. Provide Additional RTNs:

☐ a. Check here if this AUL Submittal covers additional Release Tracking Numbers (RTNs).

b. Provide the additional Release Tracking Number(s) covered by this AUL Submittal. ☐ - ☐ ☐ - ☐

(All sections of this transmittal form must be filled out unless otherwise noted above. BWSC113A is required for all submittals listed above)

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC113

ACTIVITY & USE LIMITATION (AUL) TRANSMITTAL FORM

Pursuant to 310 CMR 40.1056 & 40.1070 - 40.1084 (Subpart J)

Release Tracking Number: 3 - 23246

C. AUL INFORMATION:

1. Document (per Section B) Recording and/or Registration Information:

a. Name of Registry of Deeds and/or Land Registration Office: MIDDLESEX SOUTH DISTRICT REGISTRY OF DEEDS

b. Book and Page Number and/or Document Number: BOOK 53716 PAGE 298

c. Date of recording and/or registration: 10/23/2009 (mm/dd/yyyy)

2. Is the address of the property subject to AUL different from the disposal site address listed above?

☐ a. No ☑ b. Yes If yes, then fill out address section below.

3. Street Address: 12 MORTON STREET

4. City/Town: SOMERVILLE, MA 5. ZIP Code: 02145-4206

D. PERSON SUBMITTING AUL TRANSMITTAL FORM:

1. Check all that apply: ☐ a. change in contact name ☐ b. change of address ☐ c. change in the person undertaking response actions

2. Name of Organization: UNIFIRST CORPORATION

3. Contact First Name: JOHN R 4. Last Name: BADEY

5. Street: 68 JONSPIN RD 6. Title: VICE PRESIDENT

7. City/Town: WILMINGTON 8. State: MA 9. ZIP Code: 01887-1090

10. Telephone: (800) 347-7888 11. Ext.: 12. FAX: (978) 988-1305

13. Is the person described in this section the owner of the property?

☐ a. Yes ☑ b. No , if checked then Section G must be filled out by at least one owner.

☐ c. Check here if providing names and addresses of any additional owners in an attachment.

E. RELATIONSHIP TO DISPOSAL SITE OF PERSON SUBMITTING AUL TRANSMITTAL FORM: (check one)

☑ 1. RP or PRP ☐ a. Owner ☐ b. Operator ☐ c. Generator ☐ d. Transporter

☑ e. Other RP or PRP Specify: OTHER PRPS

☐ 2. Fiduciary, Secured Lender or Municipality with Exempt Status (as defined by M.G.L. c. 21E, s. 2)

☐ 3. Agency or Public Utility on a Right of Way (as defined by M.G.L. c. 21E, s. 5(j))

☐ 4. Any Other Person Submitting AUL Specify:

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC113

ACTIVITY & USE LIMITATION (AUL) TRANSMITTAL FORM

Pursuant to 310 CMR 40.1056 & 40.1070 - 40.1084 (Subpart J)

Release Tracking Number
3 - 23246

F. REQUIRED ATTACHMENT AND SUBMITTALS:

☑ 1. Check here to certify that notice of the proposed Activity and Use Limitation (AUL) was given to all record-interest holders, if any, in accordance with 310 CMR 40.1074(1)(e), via certified mail.

- ☐ a. Check here if there were no record interest holders.
- b. Date of certified mailing: 08/14/2009 (mm/dd/yyyy)
- ☑ c. Check here to certify that names and addresses of all record holders notified is attached.

☑ 2. Check here to certify that within 30 days of recording and/or registering the AUL, including amending, releasing or terminating the AUL, a copy of the AUL was/will be provided to the Chief Municipal Officer, the Board of Health, the Zoning Official, and the Building Code Enforcement Official in the community(ies) where the the property subject to such Activity and Use Limitation is located.

☑ 3. Check here to certify that within 30 days of recording and/or registering the AUL, including amending, releasing or terminating the AUL, a Legal Notice was/will be published in a newspaper with circulation in the community(ies) where the property subject to the AUL is located.

☑ 4. Check here to certify that within 7 days of publishing a Legal Notice in a newspaper with circulation in the community(ies) where the property subject to the AUL is located, a copy of the notice was/will be submitted to DEP.

☑ 5. Check here to certify that within 30 days of recording and/or registering the AUL, including amending, releasing or terminating the AUL, a certified copy of the AUL, including the LSP Opininon containing the material facts, data, and other information, will be submitted to DEP.

☐ 6. Check here if any non-updatable information provided on this form is incorrect, e.g. Site Address/Location Aid. Send corrections to the DEP Regional Office.

☐ 7. If an **Evaluation of Changes in Land Uses/Activities and/or Site Conditions after a Response Action Outcome Statement** is being submitted, check here to certify that the LSP Opinion containing the material facts, data, and other information is attached.

G. CERTIFICATION OF OWNER OF PROPERTY, IF NOT PERSON SUBMITTING AUL TRANSMITTAL FORM:

1. I, Lisa Roberts, attest under the pains and penalties of perjury that I am the owner of said property(ies), subject to the AUL

2. Lisa Roberts
Signature

3. Date: 9/23/09 (mm/dd/yyyy)

4. Name of Organization: LISA MARIE ROBERTS AS TRUSTEE OF THE 12 MORTON STREET NOMINEE TRUST

5. Contact First Name: LISA MARIE
6. Last Name: ROBERTS

7. Street: 18 TREMONT STREET
8. Title: TRUSTEE

9. City/Town: BOSTON
10. State: MA
11. ZIP Code: 02108-2301

12. Telephone: (781) 721-4029
13. Ext.:
14. FAX:

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC113

ACTIVITY & USE LIMITATION (AUL) TRANSMITTAL FORM

Pursuant to 310 CMR 40.1056 & 40.1070 - 40.1084 (Subpart J)

Release Tracking Number
3 - 23246

H. CERTIFICATION OF PERSON MAKING SUBMITTAL:

1. I, John R Badey , attest under the pains and penalties of perjury (i) that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this transmittal form, (ii) that, based on my inquiry of those individuals immediately responsible for obtaining the information, the material information contained in this submittal is, to the best of my knowledge and belief, true, accurate and complete, and (iii) that I am fully authorized to make this attestation on behalf of the entity legally responsible for this submittal. I/the person or entity on whose behalf this submittal is made am/is aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate, or incomplete information.

Pursuant to 310 CMR 40.1074 (1)(f), I also hereby certify under penalties of perjury, that either I (if person submitting the AUL Transmittal Form is the property owner), or **LISA MARIE ROBERTS, TRUSTEE, 12 MORTON ST NOMINEE TRUST**

2. Name of Property Owner

am/is identified on the Notice of AUL as the owner of the property subject to the AUL, owned such property on the date that the AUL was recorded and /or registered

3. By: John R Badey
Signature

4. Title: **VICE PRESIDENT**

5. For: **UNIFIRST CORPORATION**
(Name of person or entity recorded in Section D)

6. Date: 9/29/2009
mm/dd/yyyy

☐ 7. Check here if the address of the person providing certification is different from address recorded in Section D.

8. Street: ______

9. City/Town: ______ 10. State: ______ 11. ZIP Code: ______

12. Telephone: ______ 13. Ext.: ______ 14. FAX: ______

YOU ARE SUBJECT TO AN ANNUAL COMPLIANCE ASSURANCE FEE OF UP TO $10,000 PER BILLABLE YEAR FOR THIS DISPOSAL SITE. YOU MUST LEGIBLY COMPLETE ALL RELEVANT SECTIONS OF THIS FORM OR DEP MAY RETURN THE DOCUMENT AS INCOMPLETE. IF YOU SUBMIT AN INCOMPLETE FORM, YOU MAY BE PENALIZED FOR MISSING A REQUIRED DEADLINE.

Date Stamp (DEP USE ONLY:)

Supplement to BWSC113, Section F.1.c.

In accordance with the Massachusetts contingency Plan (MCP; 310 CMR 40.0000), and on behalf of UniFirst Corporation, we prepared letters dated August 13, 2009, to notify the following record of interest holders that an Activity and Use Limitation (AUL) was going to be placed on the property located at 95R Franklin Street in Somerville, Massachusetts (the Property).

Ms. Lisa Marie Roberts, Trustee
12 Morton Street Nominee Trust
c/o Marsh, Moriarty, Ontell, & Golder, PC
Attn: Michael Marsh
18 Tremont Street
Boston, MA 02108-2301

Mr. John R.Badey
Vice President
UniFirst Corporation
68 Jonspin Road
Wilmington, MA 01887-1090

Mr. Chad R. Scott
12 Morton Street, Unit 1
Somerville, MA 02145-4206

Ms. Sophia Thakali
12 Morton Street, Unit 3
Somerville, MA 02145-4206

Appendix B

Certified Copy of AUL

2009 00205401
Bk: 53716 Pg: 298 Doc: NOT
Page: 1 of 20 10/23/2009 11:21 AM

Form 1075

NOTICE OF ACTIVITY AND USE LIMITATION
M.G.L. c. 21E, § 6 and 310 CMR 40.0000

Disposal Site Name: 50 Tufts Street, Somerville, Massachusetts
DEP Release Tracking No.(s): 3-23246

This Notice of Activity and Use Limitation ("Notice") is made as of this 23rd day of October, 2009, by Lisa Marie Roberts as Trustee of the 12 Morton Street Nominee Trust c/o Marsh, Moriarty, Ontell & Golder, PC, 18 Tremont Street, Boston, Massachusetts, together with her successors and assigns (collectively "Owner").

WITNESSETH:

20 TUFTS STREET, SOMERVILLE
12 MORTON STREET, SOMERVILLE

WHEREAS, Lisa Marie Roberts as Trustee of the 12 Morton Street Nominee Trust is the owner in fee simple of that certain parcel of land located at 12 Morton Street in Somerville, Middlesex County, Massachusetts with the buildings and improvements thereon, pursuant to a deed recorded with the Middlesex South District Registry of Deeds in Book 51487, Page 127;

WHEREAS, said parcel of land, which is more particularly bounded and described in Exhibit A, attached hereto and made a part hereof ("Property") is subject to this Notice of Activity and Use Limitation. The Property is shown on a plan recorded in the Middlesex South District Registry of Deeds in Plan Book 64, Plan 34;

WHEREAS, the Property comprises part of a disposal site as the result of a release of oil and/or hazardous material. Exhibit B is a sketch plan showing the relationship of the Property subject to this Notice of Activity and Use Limitation to the boundaries of said disposal site existing within the limits of the Property and to the extent such boundaries have been established. Exhibit B is attached hereto and made a part hereof; and

WHEREAS, one or more response actions have been selected for a Portion of the Disposal Site in accordance with M.G.L. c. 21E ("Chapter 21E") and the Massachusetts Contingency Plan, 310 CMR 40.0000 ("MCP"). Said response actions are based upon (a) the restriction of human access to and contact with oil and/or hazardous material in soil and/or (b) the restriction of certain activities occurring in, on, through, over, or under the Property. The basis for such restrictions is set forth in an Activity and Use Limitation Opinion ("AUL Opinion"), dated OCTOBER 5, 2009, (which is attached hereto as Exhibit C and made a part hereof);

NOW, THEREFORE, notice is hereby given that the activity and use limitations set forth in said AUL Opinion are as follows:

1. Activities and Uses Consistent with the AUL Opinion. The AUL Opinion provides that a condition of No Significant Risk to health, safety, public welfare, or the environment exists for any foreseeable period of time (pursuant to 310 CMR 40.0000) so long as any of the following activities and uses occur on the Property:

Goodwin Procter LLP
53 State Street
Boston, MA 02109

(i) Any use of the existing building located on the Property, including use of the building as a residence, so long as the vapor barrier and venting system comprising the Exposure Pathway Elimination Measure ("EPEM") are maintained and, if an electric fan is added to the EPEM, such fan operates continuously;

(ii) Activities and uses which are not identified by this Notice as being inconsistent with maintaining a condition of No Significant Risk;

(iii) Such other activities or uses which, in the Opinion of an LSP, shall present no greater risk of harm to health, safety, public welfare, or the environment than the activities and uses set forth in this Paragraph; and

(iv) Such other activities and uses not identified as being Activities and Uses Inconsistent with the AUL.

2. Activities and Uses Inconsistent with the AUL Opinion. Activities and uses which are inconsistent with the objectives of this Notice of Activity and Use Limitation, and which, if implemented at the Property, may result in a significant risk of harm to health, safety, public welfare, or the environment or in a substantial hazard, are as follows:

(i) In the basement, removal or damage of the concrete floor, the overlying elastomeric coating, the vapor barrier, the sub-slab venting system, and/or the protective stucco wall finish;

(ii) In the basement, any activities which may damage and/or compromise the concrete floor, the overlying elastomeric coating, the vapor barrier, the sub-slab venting system, and/or the protective stucco wall finish;

(iii) In the event an electric fan is added to the EPEM, removal or damage of such fan;

(iv) In the event an electric fan is added to the EPEM, shutting down, turning off, or removing electrical power to the fan, or any other activity that would make such fan inoperable;

(v) Any activities which may damage and/or compromise the ventilation piping located on the exterior of the building; and

(vi) Construction of any occupied structure at the Property without the installation of an EPEM and subsequent indoor air sampling to confirm its effectiveness in preventing or mitigating vapor intrusion into the structure.

3. Obligations and Conditions Set Forth in the AUL Opinion. Obligations and/or conditions to be undertaken and/or maintained at the Property to maintain a

condition of No Significant Risk as set forth in the AUL Opinion shall include the following:

(i) In the basement, the integrity of the concrete floor, the overlying elastomeric floor coating, the vapor barrier, the sub-slab venting system, and the protective stucco wall finish of the existing building must be preserved and the elements of the EPEM must not be damaged or altered;

(ii) On the exterior of the building, the integrity of the ventilation piping must be preserved, and the elements of the piping must not be damaged or altered;

(iii) In the event an electric fan is added to the EPEM, power must be maintained to such fan and the fan may not be shut down;

(iv) In the event an electric fan is added to the EPEM, notification must be provided to UniFirst Corporation, together with its successors and assigns and/or its agents, if such fan becomes inoperable, and access must be provided to UniFirst Corporation, together with its successors and assigns and/or its agents, to repair or replace the fan as necessary;

(v) Access must be provided, at least annually, to UniFirst Corporation, together with its successors and assigns and/or its agents, to inspect the EPEM for damage and, to the extent necessary to continue the EPEM's effectiveness in preventing or mitigating vapor intrusion into the building, to conduct indoor air testing and/or repair or replace the vapor barrier, venting system, and/or electric fan (to the extent such a fan is added to the EPEM); and

(vi) Any future construction of an occupied structure at the Property must include the installation of an EPEM to prevent or mitigate vapor intrusion into the structure. The design of the EPEM must be incorporated into the design and construction of the future structure and must be evaluated by an LSP. Follow-up indoor air testing must be conducted to confirm the effectiveness of the EPEM in preventing or mitigating vapor intrusion into the structure.

4. Proposed Changes in Activities and Uses. Any proposed changes in activities and uses at the Property which may result in higher levels of exposure to oil and/or hazardous material than currently exist shall be evaluated by an LSP who shall render an Opinion, in accordance with 310 CMR 40.1080 *et seq.*, as to whether the proposed changes will present a significant risk of harm to health, safety, public welfare, or the environment. Any and all requirements set forth in the Opinion to meet the objective of this Notice shall be satisfied before any such activity or use is commenced.

5. Violation of a Response Action Outcome. The activities, uses, and/or exposures upon which this Notice is based shall not change at any time to cause a significant risk of harm to health, safety, public welfare, or the environment or to create substantial hazards due to exposure to oil and/or hazardous material without the prior evaluation by an LSP in accordance with 310 CMR 40.1080 *et seq.*, and without additional response actions, if necessary, to achieve or maintain a condition of No Significant Risk or to eliminate substantial hazards.

If the activities, uses, and/or exposures upon which this Notice is based change without the prior evaluation and additional response actions determined to be necessary by an LSP in accordance with 310 CMR 40.1080 *et seq.*, the owner or operator of the Property subject to this Notice at the time that the activities, uses and/or exposures change, shall comply with the requirements set forth in 310 CMR 40.0020.

6. Incorporation Into Deeds, Mortgages, Leases, and Instruments of Transfer. This Notice shall be incorporated either in full or by reference into all future deeds, easements, mortgages, leases, licenses, occupancy agreements, or any other instrument of transfer, whereby an interest in and/or a right to use the Property or a portion thereof is conveyed.

Owner hereby authorizes and consents to the filing and recordation and/or registration of this Notice, said Notice to become effective when executed under seal by the undersigned LSP, and recorded and/or registered with the appropriate Registry(ies) of Deeds and/or Land Registration Office(s).

WITNESS the execution hereof under seal this 23 day of September, 2009.

Lisa Roberts
Lisa Marie Roberts, Trustee
12 Morton Street Nominee Trust

COMMONWEALTH OF MASSACHUSETTS

Middlesex, ss ____________, 2009

On this 23 day of September, 2009, before me, the undersigned notary public, personally appeared Lisa Roberts, proved to me through satisfactory evidence of identification, which were MA Driver License, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily for its stated purpose.

Kathleen M Jamer
Notary Public
My Commission Expires:

KATHLEEN M. JAMER
NOTARY PUBLIC
STATE OF MASSACHUSETTS
Commission Expires: September 24, 2015

The undersigned LSP hereby certifies that she executed the aforesaid Activity and Use Limitation Opinion attached hereto as Exhibit C and made a part hereof and that in her Opinion this Notice of Activity and Use Limitation is consistent with the terms set forth in said Activity and Use Limitation Opinion.

Date: 10/05/09

Ileen S. Gladstone, [illegible] ED AP
[LS[illegible]]

ILEEN S. GLADSTONE No 9719

COMMONWEALTH OF MASSACHUSETTS

Middlesex, ss ____________, 2009

On this 5 day of October, 2009, before me, the undersigned notary public, personally appeared ILEEN GLADSTONE, proved to me through satisfactory evidence of identification, which were MA. DRIVER LICENSE, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily for its stated purpose.

Notary Public
My Commission Expires:

Form 1075
Notice Of Activity And Use Limitation
M.G.L. c. 21E, § 6 and 310 CMR 40.0000
Page 6 of 6

Upon recording, return to:

Lisa Marie Roberts, Trustee
12 Morton Street Nominee Trust
c/o Marsh, Moriarty, Ontell, & Golder, PC
Attn: Michael Marsh
18 Tremont Street
Boston, MA 02108-2301

Exhibit A

Metes and Bounds Description of AUL Area

2008 00123127
Bk: 51487 Pg: 127 Doc: DEED
Page: 1 of 2 07/25/2008 01:43 PM

QUITCLAIM DEED

I, Stanley R. Hunter, for consideration paid and in full consideration of Four Hundred Eighty Thousand ($480,000.00) Dollars grant to Lisa Marie Roberts, Trustee of the 12 Morton Street Nominee Trust with QUITCLAIM COVENANTS

a parcel of land with the buildings thereon situated on the southwesterly side of Morton Street, Somerville, Middlesex County, being Lot 5, as shown on a plan of land belonging to Charles Robinson, made by George A. Kimball, March 15, 1890 and recorded with Middlesex South District Deeds, Plan Book 64, Plan 34 and bounded:

NORTHEASTERLY	by Morton Street, forty (40) feet;
SOUTHEASTERLY	by Lot 4 on said plan, eighty (80) feet;
SOUTHWESTERLY	by land of owners unknown, forty (40) feet;
NORTHWESTERLY	by Lot 6 on said plan, eighty (80) feet.

For my title see Deed recorded with the Middlesex South Registry of Deeds in Book 39310, Page 393.

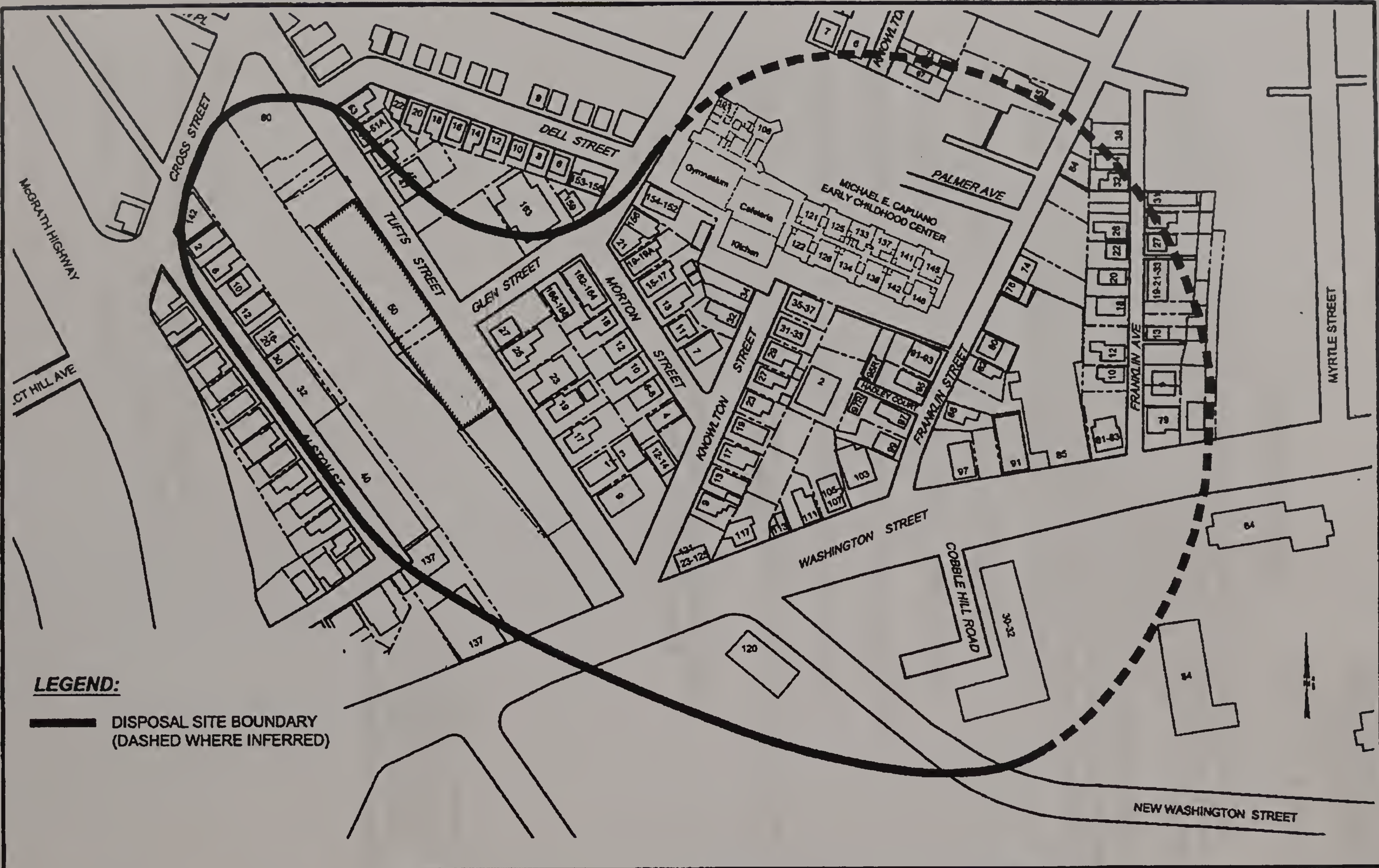
LOC +gtee - 12 Morton Street, Somerville Massachusetts

MASSACHUSETTS EXCISE TAX
Southern Middlesex District ROD # 001
Date: 07/25/2008 01:43 PM
Ctrl# 112473 01317 Doc# 00123127
Fee: $2,188.80 Cons: $480,000.00

Return to:
Marsh, Moriarty, Ontell & Golder
18 Tremont Street Suite 900
Boston, MA 02108

Exhibit B

Sketch Plan of Disposal Site Boundary (Exhibit B-1)
Sketch Plan of AUL Area (Exhibit B-2)



Activity and Use Limitation
50 Tufts Street
Somerville, Massachusetts

UniFirst Corporation
Wilmington, Massachusetts

GEI Consultants

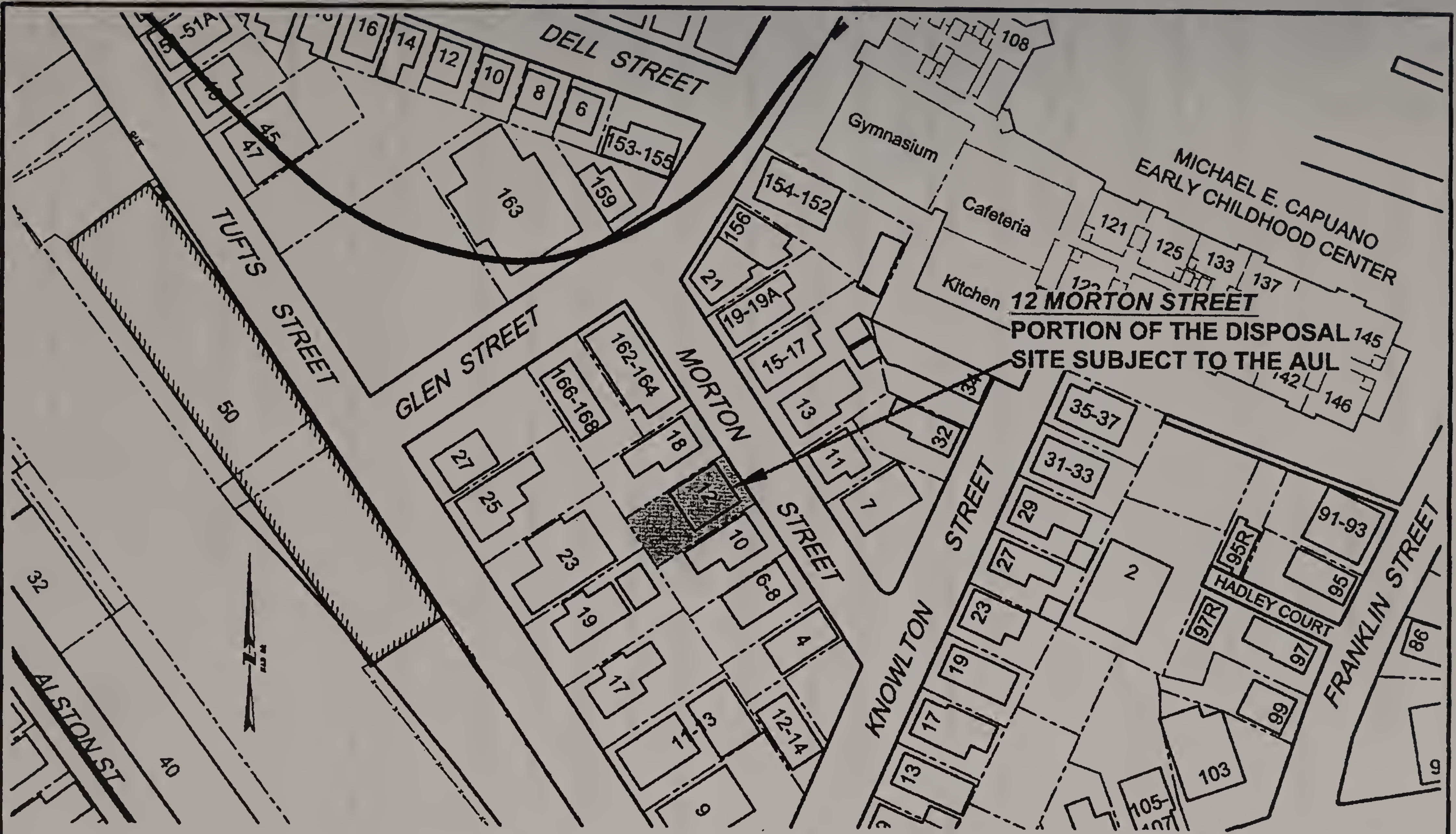
SITE SKETCH

Project 04516-3

September 2009

Exhibit B-1

N:\04516\#Drafting\04516-3\AULs\045163 - Exhibit B-1



LEGEND:

▬ DISPOSAL SITE BOUNDARY
(DASHED WHERE INFERRED)

0 100 200
SCALE, FEET

Activity and Use Limitation
50 Tufts Street
Somerville, Massachusetts

UniFirst Corporation
Wilmington, Massachusetts

GEI Consultants

SITE SKETCH

Project 04516-3

September 2009

Exhibit B-2

N:\04516\#Drafting\04516-3\AULs\045163 - 12 MORTON

Exhibit C

LSP AUL Opinion

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC113A

ACTIVITY & USE LIMITATION (AUL) OPINION FORM

Pursuant to 310 CMR 40.1056 & 40.1070 - 40.1084 (Subpart J)

Release Tracking Number 3 - 23246

A. DISPOSAL SITE LOCATION:

1. Disposal Site Name: 50 TUFTS ST & PROP ACROSS THE ST

2. Street Address: 50 TUFTS ST

3. City/Town: SOMERVILLE 4. ZIP Code: 02145-4129

B. THIS FORM IS BEING USED TO: (check one)

☑ 1. Provide the LSP Opinion for a **Notice of Activity and Use Limitation**, pursuant to 310 CMR 40.1074.

☐ 2. Provide the LSP Opinion for an **Evaluation of Changes in Land Uses/Activities and/or Site Conditions after a Response Action Outcome Statement**, pursuant to 310 CMR 40.1080. Include BWSC113A as an attachment to BWSC113. Section A and C do not need to be completed.

☐ 3. Provide the LSP Opinion for an **Amended Notice of Activity and Use Limitation**, pursuant to 310 CMR 40.1081(4).

☐ 4. Provide the LSP Opinion for a **Partial Termination of a Notice of Activity and Use Limitation**, pursuant to 310 CMR 40.1083(3).

☐ 5. Provide the LSP Opinion for a **Termination of a Notice of Activity and Use Limitation**, pursuant to 310 CMR 40.1083(1)(d).

☐ 6. Provide the LSP Opinion for a **Grant of Environmental Restriction**, pursuant to 310 CMR 40.1071.

☐ 7. Provide the LSP Opinion for an **Amendment of a Grant of Environmental Restriction**, pursuant to 310 CMR 40.1081(3).

☐ 8. Provide the LSP Opinion for a **Partial Release of a Grant of Environmental Restriction**, pursuant to 310 CMR 40.1083(2).

☐ 9. Provide the LSP Opinion for a **Release of a Grant of Environmental Restriction**, pursuant to 310 CMR 40.1083(1)(c).

☐ 10. Provide the LSP Opinion for a **Confirmatory Activity and Use Limitation**, pursuant to 310 CMR 40.1085(4).

(Unless otherwise noted above, all sections of this form (BWSC113A) must be completely filled out, printed, stamped, signed with black ink and attached as an exhibit to the AUL Document to be recorded and/or registered with the Registry of Deeds and/or Land Registration Office.)

C. AUL INFORMATION:

1. Is the address of the property subject to AUL different from the disposal site address listed above?

☐ a. No ☑ b. Yes If yes, then fill out address section below.

2. Street Address: 12 MORTON STREET

3. City/Town: SOMERVILLE, MA 4. ZIP Code: 02145-4206

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC113A

ACTIVITY & USE LIMITATION (AUL) OPINION FORM

Pursuant to 310 CMR 40.1056 & 40.1070 - 40.1084 (Subpart J)

Release Tracking Number
3 - 23246

D. LSP SIGNATURE AND STAMP:

I attest under the pains and penalties of perjury that I have personally examined and am familiar with this transmittal form, including any and all documents accompanying this submittal. In my professional opinion and judgment based upon application of (i) the standard of care in 309 CMR 4.02(1), (ii) the applicable provisions of 309 CMR 4.02(2) and (3), and 309 CMR4.03(2), and (iii) the provisions of 309 CMR 4.03(3), to the best of my knowledge, information and belief,

> *if Section B indicates that a* ***Notice of Activity and Use Limitation*** *is being registered and/or recorded*, the Activity and Use Limitation that is the subject of this submittal (i) is being provided in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (ii) complies with 310 CMR 40.1074;

> *if Section B indicates that an* ***Evaluation of Changes in Land Uses/Activities and/or Site Conditions after a Response Action Outcome Statement*** is being submitted, this evaluation was developed in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (ii) complies with 310 CMR 40.1080;

> *if Section B indicates that an* ***Amended Notice of Activity and Use Limitation or Amendment to a Grant of Environmental Restriction*** *is being registered and/or recorded*, the Activity and Use Limitation that is the subject of this submittal (i) is being provided in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (ii) complies with 40.1081;

> *if Section B indicates that a* ***Termination or a Partial Termination of a Notice of Activity and Use Limitation, or a Release or Partial Release of a Grant of Environmental Restriction*** *is being registered and/or recorded*, the Activity and Use Limitation that is the subject of this submittal (i) is being provided in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (ii) complies with 310 CMR 40.1083;

> *if Section B indicates that a* ***Grant of Environmental Restriction*** *is being registered and/or recorded*, the Activity and Use Limitation that is the subject of this submittal (i) is being provided in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (ii) complies with 310 CMR 40.1071;

> *if Section B indicates that a* ***Confirmatory Activity and Use Limitation*** *is being registered and/or recorded*, the Activity and Use Limitation that is the subject of this submittal (i) is being provided in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (ii) complies with 310 CMR 40.1085(4);

I am aware that significant penalties may result, including, but not limited to, possible fines and imprisonment, if I submit information which I know to be false, inaccurate or materially incomplete.

1. LSP #: 9719
2. First Name: ILEEN S   3. Last Name: GLADSTONE
4. Telephone: (781) 721-4012   5. Ext.:   6. FAX:
7. Signature: 8. Date: 10/5/09 mm/dd/yyyy
9. LSP Stamp:

ILEEN S. GLADSTONE
No. 9719

EXHIBIT C

OCTOBER 5, 2009

Reference: Activity and Use Limitation Opinion
12Morton Street
Somerville, Massachusetts
DEP RTN 3-23246

Introduction

This Licensed Site Professional (LSP) Opinion for a Notice of Activity and Use Limitation (AUL) was prepared by GEI Consultants, Inc. (GEI) for the property located at 12 Morton Street in Somerville, Massachusetts (the Property). The Property comprises a portion of the 50 Tufts Street disposal site (the Site) assigned Release Tracking Number (RTN) 3-23246 by the Massachusetts Department of Environmental Protection (DEP). In 2002, a historical release of chlorinated volatile organic compounds (VOCs) to soil and groundwater at the Site was reported to the DEP. Subsequent investigations at the Site identified chlorinated VOCs in indoor air at the Site, and in groundwater and indoor air at residential properties in the vicinity of the 50 Tufts Street property, including 12 Morton Street. The Property and the 50 Tufts Street property are shown on Fig. 1. UniFirst Corporation of Wilmington, Massachusetts is conducting response actions at the Site.

This LSP Opinion was prepared in accordance with the Massachusetts Contingency Plan (MCP; 310 CMR 40.1074) and the DEP Guidance on Implementing AULs (May 1999). This AUL Opinion applies to the entire Property, as defined in Exhibit A and indicated on Exhibit B of the AUL.

This LSP Opinion provides the following information:

- Why an AUL is appropriate to achieve and/or maintain a condition of No Significant Risk;
- Activities and uses to be prohibited and/or limited;
- Activities and uses to be permitted; and
- Obligations and conditions necessary to meet the objectives of the AUL.

Background

The Property is located in a commercial/residential zoning district, and fronts Morton Street to the northeast, and is bounded by residential property to the north, south, and west. The Property is located within the Site boundary associated with a historic release of chlorinated VOCs to soil and groundwater at 50 Tufts Street, located southwest of the Property across Tufts Street. From approximately 1955 to approximately 2002, 50 Tufts Street was used for storage and distribution of industrial chemicals, laundry supplies, and dry cleaning supplies. Chemicals stored at and delivered to and from 50 Tufts Street included chlorinated solvents. These chlorinated VOCs – particularly tetrachloroethylene (PCE), trichloroethylene (TCE), and 1,1,1-trichloroethane (TCA) – have been detected in soil, soil vapor, indoor air, and groundwater at 50 Tufts Street.

Based on the results of assessments conducted to date, the Site includes the 50 Tufts Street property, together with portions of properties in the neighborhood to the east and west. Based on multiple rounds of groundwater measurements, the general direction of groundwater flow at the Site is to the northeast across Tufts Street towards Knowlton and Franklin Streets.

Based on groundwater, soil, soil vapor, and indoor air sampling results, GEI identified a several-block area near 50 Tufts Street for evaluation of vapor intrusion as a potential exposure pathway. The evaluation included a program of sub-slab soil vapor testing and indoor air testing. Indoor air testing at the Property indicated the presence of chlorinated VOCs, particularly PCE, and the likelihood of a complete vapor intrusion exposure pathway. The residence at the Property includes a basement.

To eliminate or mitigate the exposure pathway, UniFirst Corporation installed an Exposure Pathway Elimination Measure (EPEM) at the Property. In the basement, the EPEM consists of a new concrete floor and a vapor barrier system both beneath the floor and on the fieldstone foundation walls, together with a venting system beneath the vapor barrier. Sketches of the EPEM installed in the basement are shown in Fig. 2.

The EPEM includes a floor ventilation system consisting of a vapor transmission layer (porous geotextile) capped by a 40-millimeter-thick, high-density polyethylene vapor barrier and a new, approximately 4-inch-thick concrete slab. Five vapor sumps are installed in the floor with polyvinyl chloride (PVC) ventilation piping that extends up to the floor joists, exits the building above the sill, and extends above the roofline. Soil vapor is captured by the vapor transmission layer and ventilated to the outdoor ambient air, bypassing the pathway through the slab into indoor air. The ventilation system is designed so that an electric powered fan may be added to facilitate the flow of soil vapor through the ventilation system. A fan will be added to the ventilation system if and when an LSP determines that such facilitation of flow is necessary or appropriate. The EPEM also includes a wall vapor barrier system comprised of a vapor transmission plane, flexible membrane, and an approximately 1-inch-thick layer of cementitious stucco that extends up to the elevation of the outdoor ground surface. The modified basement walls and floor are coated with a two-part elastomeric vapor barrier.

Indoor air testing conducted after the installation of the EPEM did not detect VOCs above laboratory method reporting limits. Installation of the EPEM achieved a condition of No Significant Risk at 12 Morton Street.

Why an AUL is appropriate to achieve and/or maintain a condition of No Significant Risk at the Site:

The EPEM eliminated or mitigated the exposure pathway for vapor intrusion of chlorinated VOCs into the indoor air at 12 Morton Street and achieved a condition of No Significant Risk. In order to maintain a condition of No Significant Risk, the integrity of the EPEM must be preserved. Therefore, this AUL is necessary to define the restricted and permitted activities to maintain a condition of No Significant Risk. The AUL is applicable to the entire Property.

AUL Restrictions

The purpose of the AUL is to preserve the integrity of the EPEM because it eliminates or mitigates the exposure pathway and achieves and/or maintains a condition of No Significant Risk.

The following are the activities and uses that will be permitted and prohibited at the Property subject to this AUL.

1. Activities and Uses Consistent with the AUL Opinion. The AUL Opinion provides that a condition of No Significant Risk to health, safety, public welfare, or the environment exists for any foreseeable period of time (pursuant to 310 CMR 40.0000) so long as any of the following activities and uses occur on the Property:

(i) Any use of the existing building located on the Property, including use of the building as a residence, so long as the vapor barrier and venting system comprising the EPEM are maintained and, if an electric fan is added to the EPEM, such fan operates continuously;

(ii) Activities and uses which are not identified by this Notice as being inconsistent with maintaining a condition of No Significant Risk;

(iii) Such other activities or uses which, in the Opinion of an LSP, shall present no greater risk of harm to health, safety, public welfare, or the environment than the activities and uses set forth in this Paragraph; and

(iv) Such other activities and uses not identified as being Activities and Uses Inconsistent with the AUL.

2. Activities and Uses Inconsistent with the AUL Opinion. Activities and uses which are inconsistent with the objectives of this Notice of Activity and Use Limitation, and which, if implemented at the Property, may result in a significant risk of harm to health, safety, public welfare, or the environment or in a substantial hazard, are as follows:

(i) In the basement, removal or damage of the concrete floor, the overlying elastomeric coating, the vapor barrier, the sub-slab venting system, and/or the protective stucco wall finish;

(ii) In the basement, any activities which may damage and/or compromise the concrete floor, the overlying elastomeric coating, the vapor barrier, the sub-slab venting system, and/or the protective stucco wall finish;

(iii) In the event an electric fan is added to the EPEM, removal or damage of such fan;

(iv) In the event an electric fan is added to the EPEM, shutting down, turning off, or removing electrical power to the fan, or any other activity that would make such fan inoperable;

(v) Any activities which may damage and/or compromise the ventilation piping located on the exterior of the building; and

(vi) Construction of any occupied structure at the Property without the installation of an EPEM and subsequent indoor air sampling to confirm its effectiveness in preventing or mitigating vapor intrusion into the structure.

3. Obligations and Conditions Set Forth in the AUL Opinion. Obligations and/or conditions to be undertaken and/or maintained at the Property to maintain a condition of No Significant Risk as set forth in the AUL Opinion shall include the following:

(i) In the basement, the integrity of the concrete floor, the overlying elastomeric floor coating, the vapor barrier, the sub-slab venting system, and the protective stucco wall finish of the existing building must be preserved and the elements of the EPEM must not be damaged or altered;

(ii) On the exterior of the building, the integrity of the ventilation piping must be preserved, and the elements of the piping must not be damaged or altered;

(iii) In the event an electric fan is added to the EPEM, power must be maintained to such fan and the fan may not be shut down;

(iv) In the event an electric fan is added to the EPEM, notification must be provided to UniFirst Corporation, together with its successors and assigns and/or its agents, if such fan becomes inoperable, and access must be provided to UniFirst Corporation, together with its successors and assigns and/or its agents, to repair or replace the fan as necessary;

(v) Access must be provided, at least annually, to UniFirst Corporation, together with its successors and assigns and/or its agents, to inspect the EPEM for damage and, to the extent necessary to continue the EPEM's effectiveness in preventing or mitigating vapor intrusion into the building, to conduct indoor air testing and/or repair or replace the vapor barrier, venting system, and/or electric fan (to the extent such a fan is added to the EPEM); and

(vi) Any future construction of an occupied structure at the Property must include the installation of an EPEM to prevent or mitigate vapor intrusion into the structure. The design of the EPEM must be incorporated into the design and construction of the future structure and must be evaluated by an LSP. Follow-up indoor air testing must be conducted to confirm the effectiveness of the EPEM in preventing or mitigating vapor intrusion into the structure.

Summary and Conclusions

This LSP Opinion has been prepared to support the implementation of a Notice of AUL for a release of oil or hazardous materials at the Property. Based on the results of the Risk Characterization and with the implementation of an AUL on the Property, it is GEI's opinion that a condition of No Significant Risk will be maintained at the Property.

Ileen S. Gladstone, P.E., LSP, LEED AP

LSP S

ILEEN
S.
GLADSTONE
No. 9719

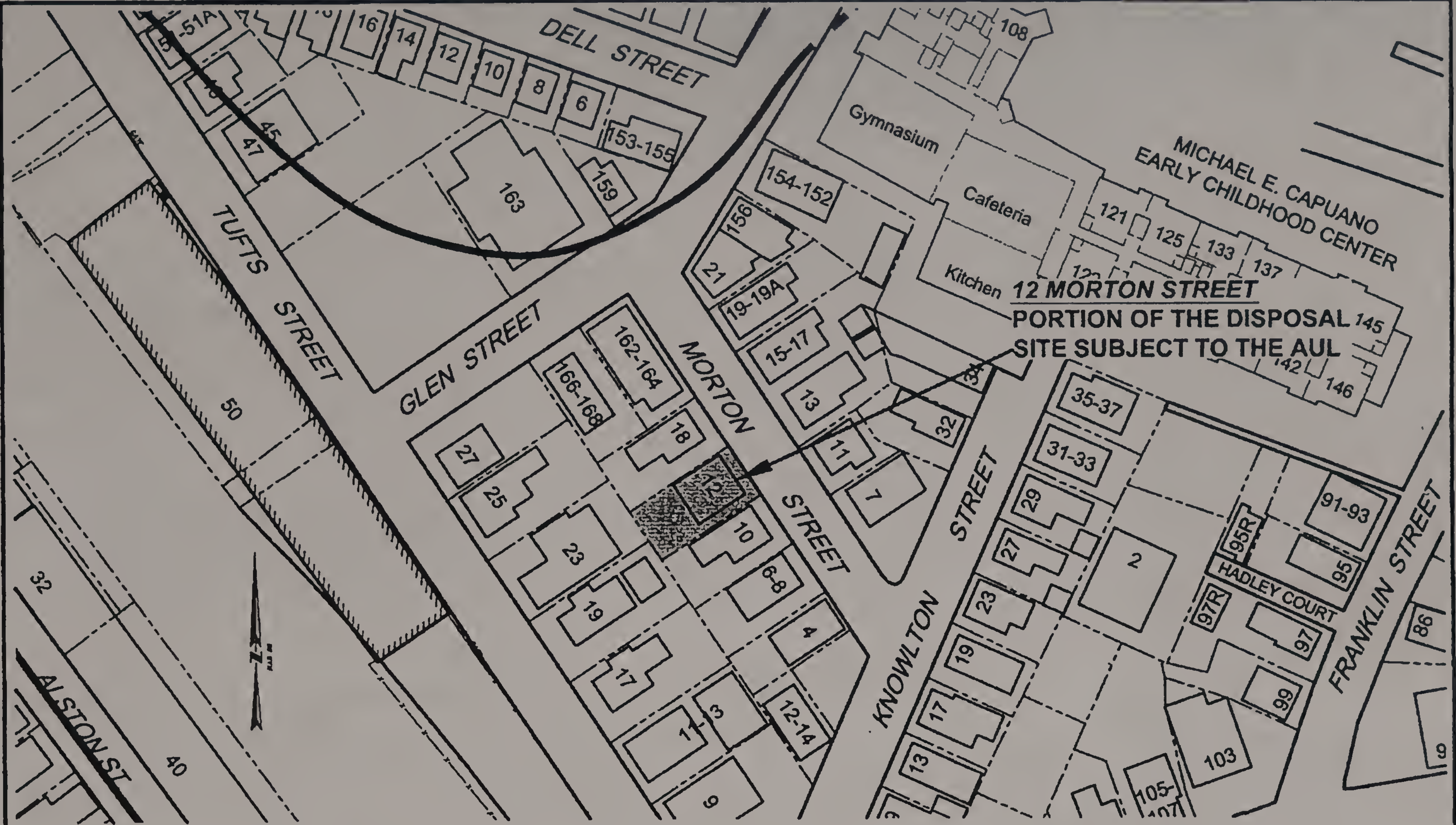
Date: 10/5/09

This AUL Opinion is based on the information presented in:

DEP (2007). The Massachusetts Contingency Plan (MCP) 310 CMR 40.0000, effective December 14.

GEI (2008). "Phase II Comprehensive Site Assessment, Method 3 Risk Characterization, and Phase III Remedial Action Plan, 50 Tufts Street, Somerville, Massachusetts," prepared for UniFirst Corporation, July 14.

GEI (2009). "Immediate Response Action Status Report No. 7 and Remedial Monitoring Report No. 10, 50 Tufts Street, Somerville, Massachusetts," prepared for UniFirst Corporation, May 11.



Activity and Use Limitation
50 Tufts Street
Somerville, Massachusetts

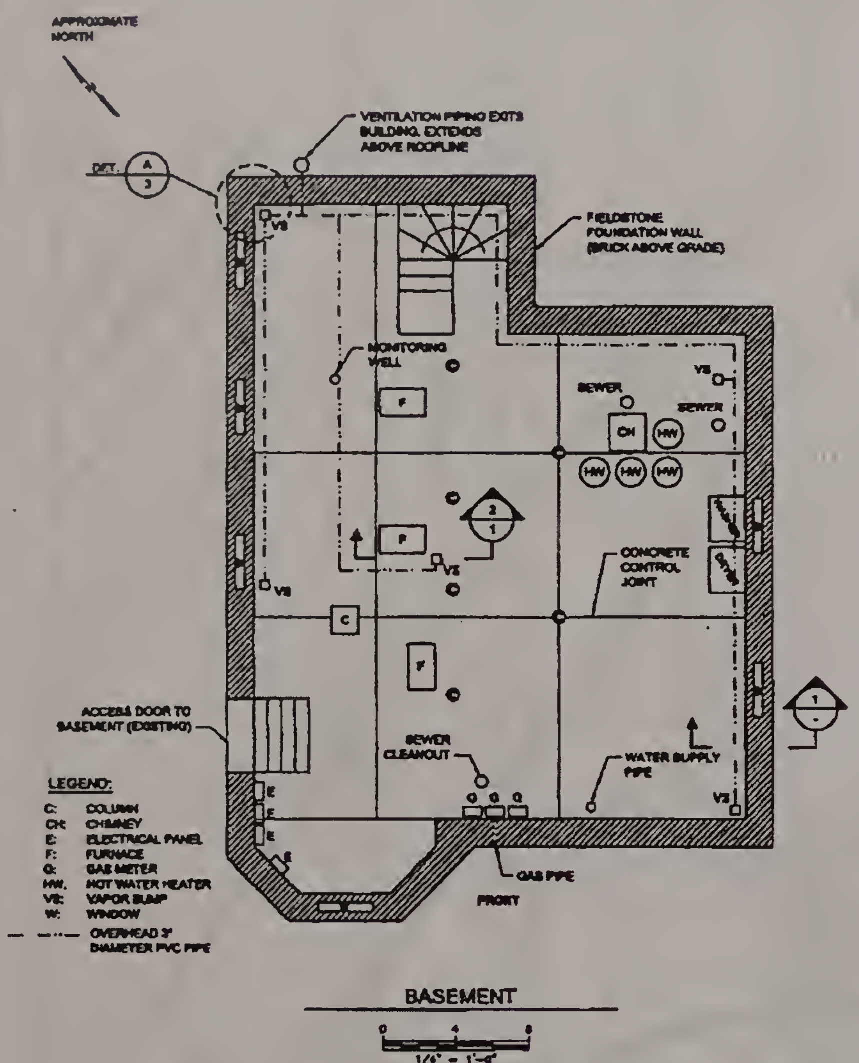
UniFirst Corporation
Wilmington, Massachusetts

GEI Consultants

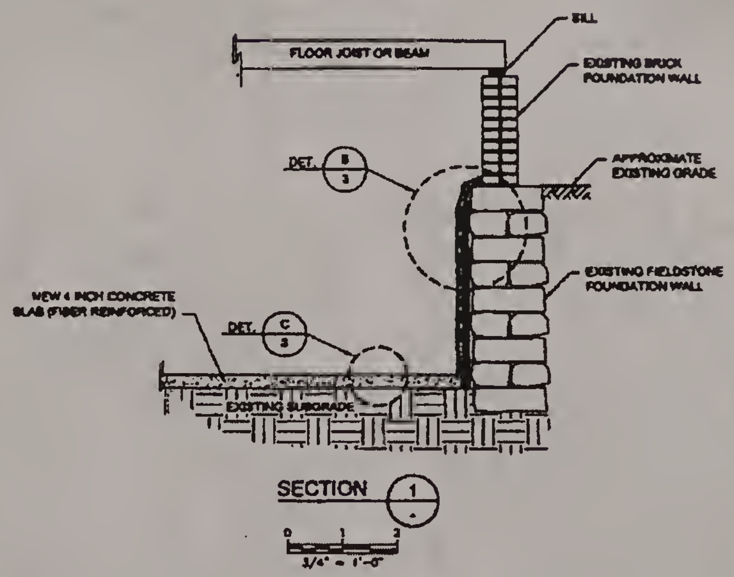
PORTION OF THE DISPOSAL SITE SUBJECT TO THE AUL

Project 04516-3 | September 2009 | Fig. 1

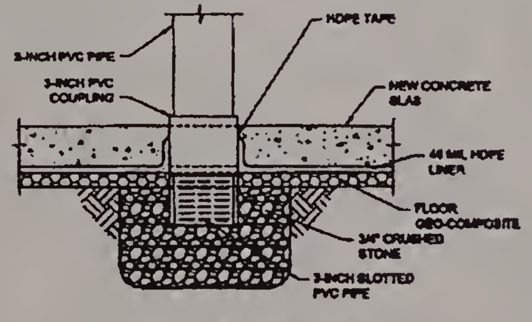
N:\04516\#Drafting\04516-3\AULs\045163 - 12 MORTON



BASEMENT


SILL
FLOOR JOIST OR BEAM
EXISTING BRICK FOUNDATION WALL
DET. B 3
APPROXIMATE EXISTING GRADE
EXISTING FIELDSTONE FOUNDATION WALL
NEW 4 INCH CONCRETE SLAB (FIBER REINFORCED)
DET. C 3
EXISTING SUBGRADE
0
1
2
3/4" = 1'-0"

SECTION 1



SECTION - VENT PIPE
PENETRATION THRU NEW BASEMENT
FLOOR SLAB
VAPOR SUMP
NOT TO SCALE
2

SPECIFICATIONS:

1) CONCRETE: IN ACCORDANCE WITH ACI 301 "SPECIFICATION FOR STRUCTURAL CONCRETE"
   - A) MINIMUM COMPRESSIVE STRENGTH (F'C) (ASTM C39): 3000 PSI @ 28 DAYS
   - B) PORTLAND CEMENT (ASTM C150): TYPE II OR IIA
   - C) MAXIMUM WATER-TO-CEMENT RATIO BY WEIGHT: 0.50
   - D) AGGREGATE (ASTM C33): 3/4-INCH NOMINAL MAXIMUM SIZE
   - E) SLUMP (ASTM C143): 2 INCHES TO 5 INCHES
   - F) AIR CONTENT: 7.0%, +/- 1.5%
   - G) PERMITTED ADMIXTURES: AIR ENTRAINING, FIBER REINFORCEMENT
2) CONCRETE FINISHING: FLOAT FINISH. CONTROL JOINTS INSTALLED EVERY 4' ON WALL AND 6' ON CENTER FOR FLOOR
3) SOLID PVC PIPE: ASTM D1785, SCHEDULE 40
4) PERFORATED PVC PIPE: ASTM D2729
5) CRUSHED STONE: MASSACHUSETTS HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, 1988 EDITION, SECTION M2.01.4 (3/4-INCH NOMINAL SIZE): GRADATION RECAPITULATED BELOW:

SIEVE SIZE	PERCENT PASSING BY WEIGHT
1 INCH	100
¾ INCH	90-100
½ INCH	10-50
⅜ INCH	0-20
NO. 4	0-5

6) WALL GEOCOMPOSITE: TENAX TENDRAIN DOUBLE-SIDED
7) FLOOR GEOCOMPOSITE: TENAX ROCK-IN-ROLL 7160-2 DOUBLE SIDED
8) FILTER FABRIC: 12 OZ. POLYPROPYLENE NON-WOVEN GEOTEXTILE
9) STUCCO: CEMENTITIOUS STUCCO FOR FIRST COAT, TWO-PART ELASTOMERIC STUCCO FOR SECOND COAT, APPLIED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. FINISHED TOTAL THICKNESS INCLUDING ALL COATS: 1 INCH, ± ⅛ INCH.
10) LATH: 3.4 POUNDS PER SQUARE YARD WEIGHT, MINIMUM 6" OVERLAP
11) PERM-A-BARRIER: W.R. GRACE & CO. PERM-A-BARRIER WALL MEMBRANE
12) MASTIC: W.R. GRACE & CO. BITUTHENE MASTIC
13) WIND DRIVEN ROTARY VENTILATOR: 4-INCH STAINLESS STEEL, 60CFM @ 4 MPH WIND

NOTES:

1. SITE PLAN BASED ON GEI FIELD MEASUREMENTS AND CITY OF SOMERVILLE TAX CARDS.
2. HEIGHT OF FIELD STONE WALLS VARIABLE TO WITHIN 0.5 FEET.
3. FURNACE, CHIMNEY, AND EXISTING SUPPORT COLUMNS WERE NOT RELOCATED.
4. THIS DRAWING HAS BEEN APPROVED BY A MASSACHUSETTS PROFESSIONAL CIVIL ENGINEER FOR THE EXCAVATION OF SOIL TO ALLOW FOR INSTALLATION OF A 4 INCH CONCRETE SLAB WITH FIBER ADMIXTURE, 40 MIL HDPE VAPOR BARRIER, AND A VOID-MAINTAINING DRAINAGE GEOCOMPOSITE TO PROVIDE A SUPPORTIVE LAYER, CAPILLARY BREAK AND VAPOR TRANSMISSION LAYER BENEATH THE HDPE VAPOR BARRIER.
5. CONSTRUCTION DETAILS ILLUSTRATED IN THIS DRAWING WILL BE INSTALLED UNDER SUPERVISION OF A MASSACHUSETTS LICENSED CONSTRUCTION SUPERVISOR.

12 Morton Street
Somerville, Massachusetts

UniFirst Corporation
Wilmington, Massachusetts

GEI Consultants

Project 04516-3

EXPOSURE PATHWAY
ELIMINATION MEASURE
DETAILS

September 2009

Fig. 2

COMMONW
MIDDLESE
SOUTH DIST
CA
I HEREBY CERTI
IS A TRUE COPY OF
RECORDED IN BOO 53776
PAGE 298
Eugene C. Brune REGISTER

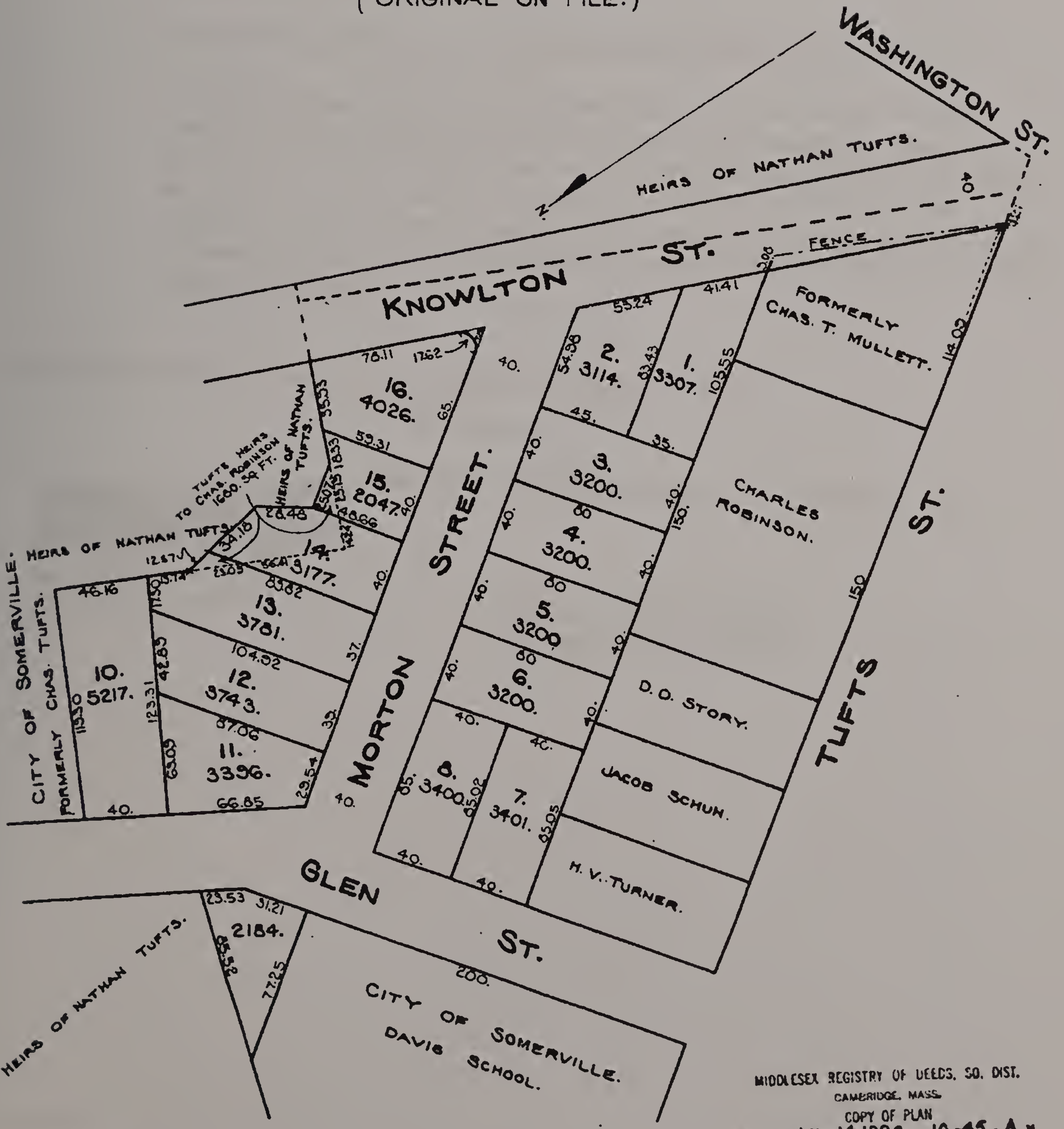
OCT 27 2009

Appendix C

Survey Plan

PLAN OF BUILDING LOTS
IN
SOMERVILLE, MASS.
OWNED BY
CHARLES ROBINSON
SCALE 40 FT. TO 1 IN. MAR. 15, 1890.
GEO. A. KIMBALL CIVIL ENGINEER.
194 WASHINGTON ST. BOSTON

(ORIGINAL ON FILE.)



MIDDLESEX REGISTRY OF DEEDS, SO. DIST.
CAMBRIDGE, MASS.
COPY OF PLAN
Recorded JUL. 14, 1890 at 10 h 45 m A M
In Plan Book 64 Plan 34
Attest Register

Appendix D

Trustee's Certificate

TRUSTEE'S CERTIFICATE

12 MORTON STREET NOMINEE TRUST

I, Lisa Marie Roberts, sole Trustee of the 12 Morton Street Nominee Trust (the "Trust") under Declaration of Trust dated July 16, 2008, recorded with the Middlesex South District Registry of Deeds (the "Registry") in Book 51487, page 121, hereby certify that:

1. I am the sole Trustee of the Trust.
2. The Trust is in full force and effect and is unmodified and unamended.
3. I, as sole Trustee, have been duly authorized by the holder of 100% of the beneficial interest in the Trust and have all the requisite approvals, power and authority to execute and deliver any and all documents (including but not limited to a Notice of Activity and Use Limitation) which the Trustee may, in her discretion, deem necessary to subject certain real property owned by the Trust and located at 12 Morton Street, Somerville, Massachusetts (the "Property") to activity and use limitations.

EXECUTED as a sealed instrument this 23 day of September, 2009.

2009 00205400
Bk: 53716 Pg: 296 Doc: CERT
Page: 1 of 2 10/23/2009 11:21 AM

12 MORTON STREET NOMINEE TRUST

Lisa Roberts
Lisa Marie Roberts, Trustee

Goodwin Procter LLP
53 State Street
Boston, MA 02109

COMMONWEALTH OF MASSACHUSETTS

County of Middlesex , ss.

On this 23 day of September, 2009, before me, the undersigned notary public, personally appeared Lisa Marie Roberts, proved to me through satisfactory identification, which were MA Driver License , to be the person whose name is signed on the preceding or attached document, and acknowledged to me that she signed it voluntarily for its stated purpose as Trustee of the 12 Morton Street Nominee Trust.

Kathleen M Jamer
Name:
Notary Public
My Commission Expires:

KATHLEEN M. JAMER
NOTARY PUBLIC
STATE OF MASSACHUSETTS
Commission Expires: September 24, 2016

Appendix E

Record Interest Holder
Notification Letters

GEI

VIA CERTIFIED MAIL: 7004 0750 0002 1938 9074

Geotechnical
Environmental
Water Resources
Ecological

August 13, 2009
Project 04516-3

Ms. Lisa Marie Roberts, Trustee
12 Morton Street Nominee Trust
c/o Marsh, Moriarty, Ontell, & Golder, PC
Attn: Michael Marsh
18 Tremont Street
Boston, MA 02108-2301

Dear Ms. Roberts:

Re: Activity and Use Limitation Notification to Record Interest Holders
12 Morton Street
Somerville, Massachusetts
RTN 3-23246

Consistent with the Massachusetts Contingency Plan (MCP; 310 CMR 40.1074(1)(e)), this letter is being provided to notify you of the planned recording of a Notice of Activity and Use Limitation (AUL) for the above referenced property. As a record interest holder in the property, you are being provided 30 days notice prior to the recording of the Notice of AUL.

The enclosed documents (Attachments A and B, listed below) summarize the basis for and scope of the activity and use limitations to be placed on the property.

Please contact me at 781-721-4012 or igladstone@geiconsultants.com if you have any questions.

Sincerely,

GEI CONSULTANTS, INC.

Ileen S. Gladstone, P.E., LSP, LEED AP
Vice President

MCE/ISG:csh
Enclosures: Attachment A – Notice of Activity and Use Limitation
Attachment B – Licensed Site Professional (LSP) Opinion

c: John R. Badey, UniFirst
Vithal V. Deshpande, City of Somerville
Irene M. Dale, Massachusetts Department of Environmental Protection

www.geiconsultants.com

GEI Consultants, Inc.
400 Unicorn Park, Woburn, Massachusetts 01801
781.721.4000 fax: 781.721.4073

GEI Consultants

Geotechnical
Environmental
Water Resources
Ecological

VIA CERTIFIED MAIL: 7004 0750 0002 1938 9043

August 13, 2009
Project 04516-3

Mr. John R.Badey
Vice President
UniFirst Corporation
68 Jonspin Road
Wilmington, MA 01887-1090

Dear Mr. Badey:

Re: Activity and Use Limitation Notification to Record Interest Holders
12 Morton Street
Somerville, Massachusetts
RTN 3-23246

Consistent with the Massachusetts Contingency Plan (MCP; 310 CMR 40.1074(1)(e)), this letter is being provided to notify you of the planned recording of a Notice of Activity and Use Limitation (AUL) for the above referenced property. As a record interest holder in the property, you are being provided 30 days notice prior to the recording of the Notice of AUL.

The enclosed documents (Attachments A and B, listed below) summarize the basis for and scope of the activity and use limitations to be placed on the property.

Please contact me at 781-721-4012 or igladstone@geiconsultants.com if you have any questions.

Sincerely,

GEI CONSULTANTS, INC.

Ileen S. Gladstone, P.E., LSP, LEED AP
Vice President

MCE/ISG:csh
Enclosures: Attachment A – Notice of Activity and Use Limitation
Attachment B – Licensed Site Professional (LSP) Opinion

c: Greg Bibler, Esq. Goodwin Procter, LLC
Vithal V. Deshpande, City of Somerville
Irene M. Dale, Massachusetts Department of Environmental Protection

GEI

VIA CERTIFIED MAIL: 7004 0750 0002 1938 9050

Geotechnical
Environmental
Water Resources
Ecological

August 13, 2009
Project 04516-3

Mr. Chad Scott
12 Morton Street
Unit 1
Somerville, MA 02145-4206

Dear Mr. Scott:

Re: Activity and Use Limitation Notification to Record Interest Holders
12 Morton Street
Somerville, Massachusetts
RTN 3-23246

Consistent with the Massachusetts Contingency Plan (MCP; 310 CMR 40.1074(1)(e)), this letter is being provided to notify you of the planned recording of a Notice of Activity and Use Limitation (AUL) for the above referenced property. As a record interest holder in the property, you are being provided 30 days notice prior to the recording of the Notice of AUL.

The enclosed documents (Attachments A and B, listed below) summarize the basis for and scope of the activity and use limitations to be placed on the property.

Please contact me at 781-721-4012 or igladstone@geiconsultants.com if you have any questions.

Sincerely,

GEI CONSULTANTS, INC.

Ileen S. Gladstone, P.E., LSP, LEED AP
Vice President

MCE/ISG:csh

Enclosures: Attachment A – Notice of Activity and Use Limitation
Attachment B – Licensed Site Professional (LSP) Opinion

c: John R. Badey, UniFirst
Vithal V. Deshpande, City of Somerville
Irene M. Dale, Massachusetts Department of Environmental Protection

www.geiconsultants.com

GEI Consultants, Inc.
400 Unicorn Park, Woburn, Massachusetts 01801
781.721.4000 fax: 781.721.4073

GEI Consultants

VIA CERTIFIED MAIL: 7004 0750 0002 1938 9067

Geotechnical
Environmental
Water Resources
Ecological

August 13, 2009
Project 04516-3

Ms. Sophia Thakali
12 Morton Street
Unit 3
Somerville, MA 02145-4206

Dear Ms. Thakali:

Re: Activity and Use Limitation Notification to Record Interest Holders
12 Morton Street
Somerville, Massachusetts
RTN 3-23246

Consistent with the Massachusetts Contingency Plan (MCP; 310 CMR 40.1074(1)(e)), this letter is being provided to notify you of the planned recording of a Notice of Activity and Use Limitation (AUL) for the above referenced property. As a record interest holder in the property, you are being provided 30 days notice prior to the recording of the Notice of AUL.

The enclosed documents (Attachments A and B, listed below) summarize the basis for and scope of the activity and use limitations to be placed on the property.

Please contact me at 781-721-4012 or igladstone@geiconsultants.com if you have any questions.

Sincerely,

GEI CONSULTANTS, INC.

Ileen S. Gladstone, P.E., LSP, LEED AP
Vice President

MCE/ISG:csh
Enclosures: Attachment A – Notice of Activity and Use Limitation
Attachment B – Licensed Site Professional (LSP) Opinion

c: John R. Badey, UniFirst
Vithal V. Deshpande, City of Somerville
Irene M. Dale, Massachusetts Department of Environmental Protection

www.geiconsultants.com

GEI Consultants, Inc.
400 Unicorn Park, Woburn, Massachusetts 01801
781.721.4000 fax: 781.721.4073

Appendix F

Public Notification Letters

GEI Consultants

Geotechnical
Environmental
Water Resources
Ecological

November 19, 2009
Project 04516-3

Mr. Joseph A. Curtatone
Mayor, City of Somerville
Somerville City Hall
93 Highland Avenue
Somerville, MA 02143-1740

Dear Mayor Curtatone:

Re: Recording of Notice of Activity and Use Limitation
50 Tufts Street
Somerville, Massachusetts
DEP RTN 3-23246

GEI Consultants, Inc., on behalf of the UniFirst Corporation, is hereby notifying your office that a Notice of Activity and Use Limitation (AUL) was recorded with the Middlesex South District Registry of Deeds on October 23, 2009 for a portion of the above-referenced site.

The AUL was recorded for the property located at 12 Morton Street, Somerville, Massachusetts, which is a portion of the 50 Tufts Street site. The AUL identifies certain activities and uses which are consistent with maintaining a condition of No Significant Risk at 12 Morton Street, and identifies those obligations and conditions necessary to maintain a condition of No Significant Risk at the property for the foreseeable future. A copy of the AUL is attached for your review. This notification is made in fulfillment of the public notice requirements of the Massachusetts Contingency Plan (310 CMR 40.1403(7)).

If you have any questions, please contact me at 781-721-4000 or igladstone@geiconsultants.com.

Sincerely,

GEI CONSULTANTS, INC.

Ileen S. Gladstone, P.E., LSP, LEEP AP
Vice President

JDR/ISG:csh

c: John R. Badey, UniFirst Corporation
Vithal V. Deshpande, City of Somerville
Irene M. Dale, Massachusetts Department of Environmental Protection

GEI Consultants

Geotechnical
Environmental
Water Resources
Ecological

November 19, 2009
Project 04516-3

Ms. Paulette Renault Caragianes
Director, Health Department
City of Somerville
City Hall Annex
50 Evergreen Avenue
Somerville, MA 02145-2819

Dear Ms. Caragianes:

Re: Recording of Notice of Activity and Use Limitation
50 Tufts Street
Somerville, Massachusetts
DEP RTN 3-23246

GEI Consultants, Inc., on behalf of the UniFirst Corporation, is hereby notifying your office that a Notice of Activity and Use Limitation (AUL) was recorded with the Middlesex South District Registry of Deeds on October 23, 2009 for a portion of the above-referenced site.

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Vithal V. Deshpande, City of Somerville
Irene M. Dale, Massachusetts Department of Environmental Protection

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November 19, 2009
Project 04516-3

Mr. Herbert Foster
Chair, Zoning Board of Appeals
SPCD, Planning & Zoning
City of Somerville
93 Highland Avenue, 3rd Floor
Somerville, MA 02143-1740

Dear Mr. Foster:

Re: Recording of Notice of Activity and Use Limitation
50 Tufts Street
Somerville, Massachusetts
DEP RTN 3-23246

GEI Consultants, Inc., on behalf of the UniFirst Corporation, is hereby notifying your office that a Notice of Activity and Use Limitation (AUL) was recorded with the Middlesex South District Registry of Deeds on October 23, 2009 for a portion of the above-referenced site.

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If you have any questions, please contact me at 781-721-4000 or igladstone@geiconsultants.com.

Sincerely,

GEI CONSULTANTS, INC.

Ileen S. Gladstone, P.E., LSP, LEEP AP
Vice President

JDR/ISG:csh

c: John R. Badey, UniFirst Corporation
Vithal V. Deshpande, City of Somerville
Irene M. Dale, Massachusetts Department of Environmental Protection

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Ecological

November 19, 2009
Project 04516-3

Mr. George Landers
Director of Inspectional Services
SPCD, Planning & Zoning
City of Somerville
1 Franey Road
Somerville, MA 02145-2510

Dear Mr. Landers:

Re: Recording of Notice of Activity and Use Limitation
50 Tufts Street
Somerville, Massachusetts
DEP RTN 3-23246

GEI Consultants, Inc., on behalf of the UniFirst Corporation, is hereby notifying your office that a Notice of Activity and Use Limitation (AUL) was recorded with the Middlesex South District Registry of Deeds on October 23, 2009 for a portion of the above-referenced site.

The AUL was recorded for the property located at 12 Morton Street, Somerville, Massachusetts, which is a portion of the 50 Tufts Street site. The AUL identifies certain activities and uses which are consistent with maintaining a condition of No Significant Risk at 12 Morton Street, and identifies those obligations and conditions necessary to maintain a condition of No Significant Risk at the property for the foreseeable future. A copy of the AUL is attached for your review. This notification is made in fulfillment of the public notice requirements of the Massachusetts Contingency Plan (310 CMR 40.1403(7)).

If you have any questions, please contact me at 781-721-4000 or igladstone@geiconsultants.com.

Sincerely,

GEI CONSULTANTS, INC.

Ileen S. Gladstone, P.E., LSP, LEEP AP
Vice President

JDR/ISG:csh

c: John R. Badey, UniFirst Corporation
Vithal V. Deshpande, City of Somerville
Irene M. Dale, Massachusetts Department of Environmental Protection

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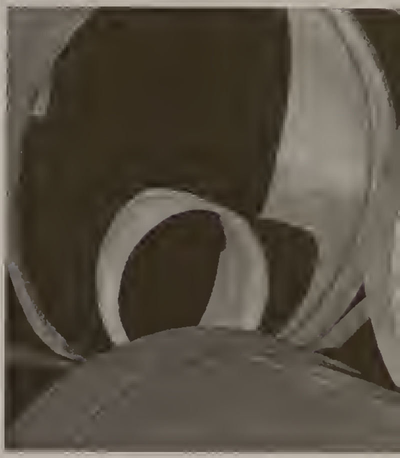
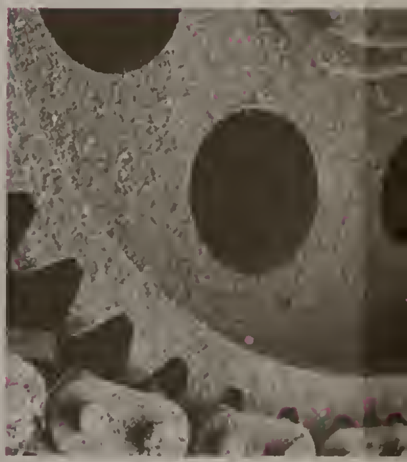




MassDEP RTN 3-23246
Class A-3 Response Action Outcome Partial Statement
for 12 Morton Street, Somerville, Massachusetts
50 Tufts Street Site, Somerville, Massachusetts
UniFirst Corporation
October 21, 2011

Appendix E

EPEM Warning Label

WARNING

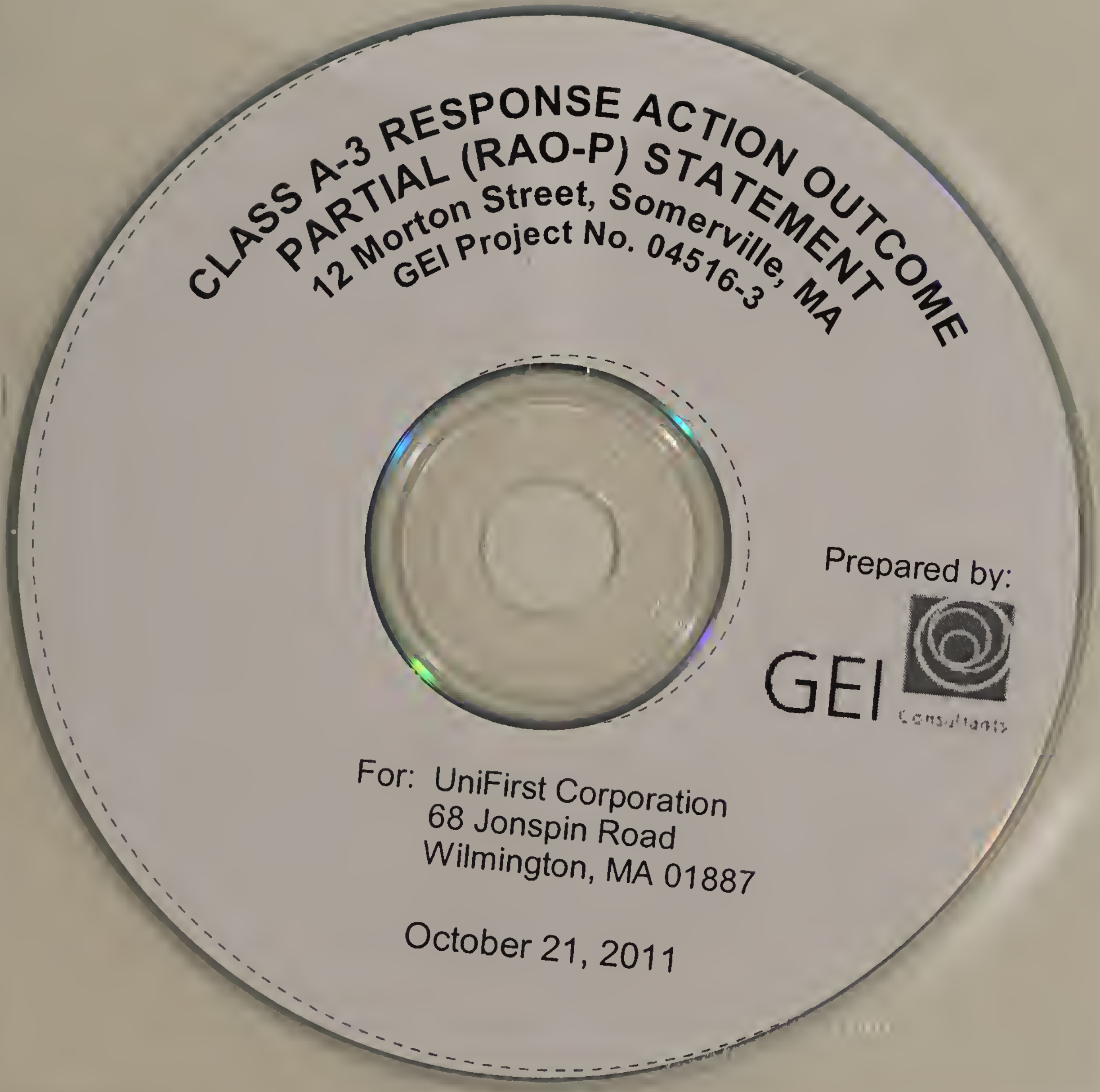
DO NOT DAMAGE OR PENETRATE THE WALL, FLOOR, OR VENTILATION PIPING

REFER TO ACTIVITY AND USE LIMITATION

CONTACT INFORMATION:

ILEEN GLADSTONE, P.E., LSP, LEED AP
GEI CONSULTANTS, INC.
(781) 721-4000
igladstone@geiconsultants.com

43730-116083 VOSS SIGNS, LLC MANLIUS, NY 13104-0553 www.VossSigns.com 1-800-473-0698



CLASS A-3 RESPONSE ACTION OUTCOME
PARTIAL (RAO-P) STATEMENT

12 Morton Street, Somerville, MA
GEI Project No. 04516-3

Prepared by:
GEI Consultants

For: UniFirst Corporation
68 Jonspin Road
Wilmington, MA 01887

October 21, 2011

w.geiconsultants.c

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